UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

JANUARY, 1889.

CONTENTS.

PREPARED UNDER THE DIRECTION OF
BRIGADIER GENERAL A. W. GREELY,
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1ST LIEUTENANT, 4TH ARTILLERY, A. S. O. AND ASSISTANT.

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WASHINGTON CITY:
SIGNAL OFFICE.
1889.

List of merchant marine steam and sailing vessels from which International Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of January, 1889.

Name of vessel.	Captain.
Am. s. s. Adirondack	Capt. J. Sansom.
Br. Adriatic	J. G. Cameron.
Advance	D. E. Griffiths.
Aguan	J. C. Adair.
Allen	J. W. Morris.
Alameda	H. G. Morse.
Am. Alamo	S. Risk.
Br. Alene	E. J. Seiders.
Ger. Allemania	F. Schroder.
Br. Alvena	F. McKay.
Alvo	David Williams.
Ambrose	E. Bixson.
Ger. America	R. Heintze.
Dtch. Amsterdam	A. Potjer.
Fr. Anadyr	E. Delacroix.
Br. Arisona	S. Brooks.
Auranis	W. H. P. Hains.
Australia	A. McRitchie.
Author	J. Everett.
Avon	W. H. Milner.
Baltimore	J. Treanery.
Bavarian	M. Fitt.
Belg. Belgenland	W. A. Beynon.
Span. Benito Estenger	E. F. Canal.
Ger. Bohemia	E. Kopff.
Br. Borderer	F. Manly.
Bothnia	T. Dutton.
Britannic	H. Parsell.
British Prince	S. Nowell.
British Queen	R. Wills.
Brooklyn City	W. Fitt.
Buffalo	J. H. Malet.
Bulgarian	R. Leask.
California	R. T. Garvie.
Californian	J. W. Pickthall.
Canada	John Robinson.
Carribbean	H. Daniel.
Carroll	G. H. Brown.
Carthaginian	A. McNicol.
Catalonia	J. J. Atkin.
Br. Celtic	H. Davison.
Cephalonia	W. S. Soccomb.
Fr. Chateau Lafite	M. C. Ollivier.
Am. Cherokee	B. F. Doane.
Br. Circassia	H. Young.
Am. City of Augusta	J. W. Catherine.
Br. City of Berlin	F. S. Land.
Am. City of Chester	R. Bond.
Br. City of Chicago	A. Redford.
Am. City of Columbia	John McIntosh.
Br. City of Newcastle	Townsend.
Am. City of Washington	J. W. Reynolds.
City of San Antonio	J. Wilder.
Br. Claribel	I. Clinkskel.
Colon	F. Henderson.
Am. Colorado	F. E. Jenkins.
Br. Counsellor	W. Lang.
Crane	G. J. Robinson.
Crown Prince	J. Scrivener.
Cuban	D. Lawson.
Damara	Geo. Dixson.
Denmark	R. S. Rigby.
Devonia	John Craig.
Discoverer	Jno. Hughes.
Earnmoor	B. Grey.
Earnwell	C. N. Mumford.
Egypt	J. Sumner
Egyptain Monarch	J. W. Bristow.
Ger. Elbe	R. Sander.
Am. El Paso	H. S. Quick.
Ger. Ems	Th. Jungst.
Br. England	A. F. Heeley.
Erin	Wm. Tyson.
Etruria	H. Walker.
Span. Euskaro	S. de Fellerio.
Am. Excelsior	H. L. Higgins.
Federation	R. Pinkham.
France	A. D. Hadley.
Fr. France	G. Collier.
Ger. Frankfurt	C. Stencken.
Fulda	R. Ringk.
Span. Gaditano	F. Goicoechea.
Br. Galileo	Wm. Magee.
Gallia	M. Murphy.
Germanic	P. J. Irving.
Ger. Gluckauf	V. Szymanski.
Gothia	G. Franck.
Br. Greece	A. J. Jeffrey.
Dan. Hekla	A. G. Thomsen.
Br. Helvetia	G. Cochrane.
Br. Hibernian	John Brown.
Holland	Thos. Foote.
Honda	J. Brownrigg.
Hudson	H. R. Freeman.
Am. Indiana	W. J. Boggs.
Br. Iowa	E. W. Owens.
Dan. Island	W. Skjodt.

Name of vessel.	Captain.
Br. s. s. Italy	Capt. W. Pearce.
Jamaican	D. Edwards.
Kansas	W. Gleig.
King's Cross	G. J. Mills.
Knickerbocker	F. Kemble.
Fr. La Bretagne	M. de'Jousselin.
La Champagne	Boyer.
La Gascogne	Santelli.
Lahn	H. Hellmers.
Ger. Lake Huron	M. L. Tranmar.
Br. Lake Nepigon	F. Carey.
Lake Ontario	H. Campbell.
Lake Superior	Wm. Stewart.
Lake Winnipeg	P. D. Murray.
Lampasas	M. B. Crowell.
Am. La Normandie	G. De Kersabiec.
Fr. Leerdam	G. Stengor.
Dtch. Llandaff City	T. H. Gore.
Br. Lord Clive	P. Urquhart.
Lord Gough	E. M. Hughes.
Lord O'Neill	A. Ferris.
Louisiana	E. V. Gager.
Am. Lydian Monarch	T. C. Huggett.
Main	Moller.
Ger. Maine	R. Griffiths.
Br. Manhattan	Frank Stevens.
Am. Manitoban	W. Dunlop.
Br. Marcea	L. O. Moen.
Ger. Marsala	N. Maass.
Br. Martello	Wm. Abbott.
Maryland	A. H. Luckhurst.
Mentmore	R. Waite.
Michigan	S. Walters.
Michigan	H. Becquet.
Mineola	T. L. Evans.
Minnesota	R. J. Blacklin.
Moravia	Bahrends.
Ger. Muriel	G. S. Locke.
Br. Nederland	C. H. Grant.
Beig. Nedjed	Thos. Pole.
Br. Nessmore	G. Elliott.
Nevada	Cushing.
Am. New York	Geo. Mason.
Beig. Noordland	H. E. Nickels.
Br. Norseman	R. Williams.
Nova Scotian	R. H. Hughes.
Am. Nueces	J. Bolger.
Br. Oceanic	J. Metcalf.
Ontario	W. P. Couch.
Oranmore	B. Jones.
Oregon	H. C. Williams.
Orinoco	J. S. Garvin.
Pascal	C. W. Crocker.
Pavonis	A. McKay.
Pawnee	J. James.
Dtch. P. Caland	G. Luts.
Am. Pennsylvania	E. B. Thomas.
Br. Peruvian	J. G. Stephens.
Beig. Pieter de Coninck	J. J. Brarens.
Ger. Polynesia	A. Kuhn.
Br. Pontiac	R. Blythe.
Ger. Preussen	C. Pohle.
Br. Republic	E. J. Smith.
Ger. Rhaetia	H. Vogelgesang.
Rhein	W. Kuhlmann.
Beig. Rhyniand	A. J. Griffin.
Br. Richmond Hill	H. Perry.
Roman	E. Maddox.
Rosarian	D. M. Killop.
Roseville	Jos. Dove.
Dtch. Rotterdam	H. C. v. d. Zee.
Br. Roxburgh Castle	A. Turpin.
Ger. Rugia	R. Karlowa.
Br. Sacrobosco	Henry Gibb.
Saint Asaph	C. H. Hossock.
Saint Regulus	S. Henry.
Saint Ronans	H. Campbell.
Samaria	J. D. Watt.
Santiago	B. Allen
Sarmatian	W. Richardson.
Sarnia	J. Gibson.
Ger. Savonia	G. Kuchenthal.
Br. Scandinavian	John Park.
Scholar	J. Corbishley.
Span. Serra	F. de Luzarraga
Br. Servia	H. McKay.
Ger. Slavonia	H. Schmidt.
Br. Spain	W. A. Griffiths.
State of Georgia	G. Moodie.
State of Indiana	A. Ritchie
State of Nebraska	A. G. Brass.
State of Nevada	J. A. Stewart.
State of Pennsylvania	A. J. A. Mann.
State of Texas	Gilbert Williams.
Ger. Strassburg	F. Rodenberg.
Suevia	C. Ludwig.
Beig. Switzerland	J. Ueberweg.

Name of vessel.	Captain.
Br. s. s. Thanemore	Capt. C. W. Simpson.
The Queen	T. P. Heeley.
Dan. Thingvalla	Larsen.
Ger. Thuringia	G Reysing.
Br. Toronto	MacAuley.
Tower Hill	R. Bennett.
Ger. Trave	W. Willigerod.
Br. Trinidad	W. J. Fraser.
Vancouver	C. J. Lindall.
Dtch. Veendam	F. H. Bonjor.
Br. Venetian	E. Parry.
Venice	A. B. Bolt.
Virginian	T. H. Fox.
Belg Waesland	H. Buschmann.
Ger. Werra	B. Bussius.
Beig. Westernland	J. C. Jamison.
Br. Wisconsin	J. P. Worral.
Ger. Wyanoke	R. B. Boaz.
Br. Wyoming	C. L. Rigby.
New York Herald reports.	
Am. Algiers	J. W. Percy.
Br. Alsatia	J. Brown.
Am. City of Alexandria	J. Deaken.
City of Para	J. L. Lockwood.
El Monte	J. W. Hawthorn.
New Orleans	T. P. Halsey.
Ohio	R. W. Sargent.
Am. Rio Grande	Jas. F. Lewis.
United States Naval.	
U. S. R. S. Dale	Yates Sterling.
U. S. S. Despatch	W. S. Cowles.
U. S. R. S. Franklin	B. S. Ricords.
U. S. S. Galena	G. W. Sumner.
U. S. S. Juniata	W. C. Wise.
U. S. S. Michigan	H. F. Picking.
U. S. S. Minnesota	G. C. Wiltse.
U. S. S. Monongahela	G. E. Wingate.
U. S. S. New Hampshire	F. J. Higginson.
U. S. S. Ossipee	A. G. Kellogg.
U. S. S. Wabash	C. C. Carpenter.
Sailing vessels.	
Am. bg. Abbie Clifford	D. W. Storer.
bk. Ada P. Gould	W. B. Henrahan.
Amy	H. E. Klager.
Ger. sp. Anna	J. Menkens.
Am. schr. Anna E. Krans	F. H. Pervere.
Dan. bk. Atalanta	J. Jepsen.
Br. Bertie	D. Daniel.
Am. schr. City of Baltimore	L. S. Tawes.
Br. sp. City of Florence	W. S. Leask.
Am. bk. C. P. Dixon	G. W. Rhodes.
Ger. sp. Dora	Meyer.
Am. pilot E. C. Knight	J. F. Springer.
schr. Ellen M. Golden	J. Johnstone.
bk. Glad Tidings	R. Roberts.
schr. Harry Prescott	W. A. Turner.
bg. Hattie	J. L. Coombs.
H. B. Hussey	G. W. Hodgdon.
bg. H. C. Sibley	G. W. Hichborn.
Dtch bk. Helena	T. T. Verbeet.
Nor. bk. Ida	T. Anderson.
Am. bk. Isaac Jackson	G. A. Goodwin.
Br. bk. Isca	J. Collie.
bk. Jennie Parker	G. E. Parker.
Ger. bg. Johanna	T. Hinrichs.
Am. schr. John J. Hanson	R. J. Stephens.
bkt. John J. Marsh	F. P. Whittier.
schr. John R. Bergen	W. H. Squires.
bkt. Jose E. More	Asmus Leonhard
Pilot boat J. F. Loubat	J. McCarty.
Port. bk. Julius	F. D. Vieira.
Am. Kennard	J.A.Bettencourt.
schr. Kensett	J. A. Smith.
Nor. bk. Knudsvig	V. E. Evenson.
Br. sp. Ladakh	John Thomas.
Am. bg. L. F. Munson	J. V. McKowen.
sp. Light-ship No. 45	Andrew Jackson.
Br. bg. Lilian	H. F. Shive.
Maggie Dixon	J. M. Donald.
Am. bkt. Matthew Baird	J. P. Williams.
schr. Maud H. Dudley	D. W. Oliver.
bk. Meguntlcook	E. E. Walker.
bkt. Monsita	F. M. Wallace.
schr. Myra W. Spear	Alfred Caswell.
schr. Nelson Bartlett	J. W. Watts.
Br. On Time	S. T. Kempton.
Am. schr. Orlando	Chas. Knaebel.
Otello	M. J. Bond.
yacht Republic	J. H. Brown.
bk. Rialto	L. P. Jorgensen.
Nor. sp. Rolf	T. S. Torgengen.
Am. schr. S. B. Hubbard	A. Mehaffy.
Br. bk. Sodium	Wm. Manson.
Ger. sp. Sophie	H. Hasenfuss.
Nor. bk. Svea	E. Thorkilsen.
Br. bk. Valona	H. Andrews.

UNITED STATES SIGNAL SERVICE
MONTHLY WEATHER REVIEW.

VOL. XVII. WASHINGTON CITY, JANUARY, 1889. No. 1.

INTRODUCTION.

This REVIEW treats generally the meteorological conditions of the United States and Canada for January, 1889, and is based upon reports of regular and voluntary observers of both countries.

On chart i the paths of the centres of nine areas of low pressure are shown; the average number traced for January during the last fifteen years being 12.9.

The areas of high and low pressure and north Atlantic storms are discussed under their respective headings. The severest storms of the month occurred on the 9th, attending the passage of low area iii. Descriptions of the more destructive storms reported on that date, together with charts (vi and vii) exhibiting isobars, isotherms, and wind-directions over the United States and Canada at 8 a. m. and 8 p. m., 75th meridian time, are published in this issue of the REVIEW. Chart i also shows the approximate paths of the centres of eight depressions traced over the north Atlantic Ocean and the limits of fog-belts west of the fortieth meridian. The average number of depressions traced over the north Atlantic for January during the last six years is 10. No ocean ice was reported during the month.

Chart ii exhibits the distribution of mean atmospheric pressure and temperature for the month. The mean temperature was below the normal in the Rocky Mountain districts, at stations in southern and western Texas, and over eastern and southern Florida; the greatest deficiencies being shown in the middle plateau region, where they exceeded 10°. In all other districts the mean temperature was above the normal, the departures being most marked in the north-central part of the country, where they were more than 10°. At several stations in the northern districts the maximum temperature was higher than for any previous January during the periods of observation.

The distribution of precipitation for January 1889, is shown on chart iii, and the normal precipitation for eighteen years is exhibited on chart iv.

The precipitation was deficient on the north Pacific coast, in the northern portions of the plateau districts and eastern Rocky Mountain slope, over an area extending from Louisiana, Mississippi, and northern Alabama to the upper Ohio valley and Lake region, within a small area in the lower Missouri valley, and in portions of New England and the Maritime Provinces; elsewhere the precipitation was in excess of the average for the month. The current and normal precipitation at the various stations and in the several districts is treated in detail under the heading of "Precipitation." In the table of excessive precipitation will be found a record of excessive monthly, daily, and hourly rainfalls for January, 1889. Under this heading there also appears a table giving the aggregate number of excessive monthly, daily, and hourly rainfalls for the several states and territories, as shown by the monthly and supplementary tables of excessive precipitation published in the MONTHLY WEATHER REVIEW during 1888.

Chart v exhibits the depth of snow on the ground at the close of the month, and its discussion appears under the heading of "Precipitation." This chart also shows the limits of freezing weather during January, 1889.

Two additional charts, based upon data contained in the annual summaries of regular and voluntary observers of the Signal Service for 1888, are published with this issue of the REVIEW. Chart viii exhibits annual mean isotherms, and departures from the normal temperatures, and chart ix shows the annual distribution of precipitation over the United States and Canada. These charts and data are discussed under the heading of "Annual Summary for 1888."

Commencing with July, 1888, the meteorological means for the regular stations of the Signal Service have been determined from observations taken twice daily at 8 a. m. and 8 p. m. (75th meridian time). These hours of observation have been permanently adopted to supersede the former system of tri-daily observations taken at eight-hour intervals. The monthly mean temperature for Signal Service stations represents the means of the maximum and minimum temperatures.

In the preparation of this REVIEW the following data, received to February 20, 1889, have been used: the regular semi-daily weather-charts, containing data of simultaneous observations taken at 133 Signal Service stations and 25 Canadian stations, as telegraphed to this office; 175 monthly journals and 177 monthly means from the former and 25 monthly means from the latter; 544 monthly registers from voluntary observers; 107 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the Hydrographic Office, United States Navy, and the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New England, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, and Texas, and the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for January, 1889, as determined from observations taken daily at 8 a. m. and 8 p. m. (75th meridian time), is shown on chart ii by isobars. On July 1, 1888, the tri-daily observations of the Signal Service were superseded by observations taken twice daily at the hours named. A protracted series of hourly observations has shown that the difference is almost inappreciable between the mean pressure obtained from two observations taken at these hours and that determined from tri-daily observations taken at eight-hour intervals.

The mean pressure for January, 1889, was highest over the middle and northern plateau regions of the Rocky Mountains, where it rose above 30.25, the highest reading, 30.31, being noted at Fort Du Chesne, Utah. From this region there was a marked decrease in mean pressure westward to the Pacific coast, where it fell below 30.10, and a very gradual decrease eastward to the Canadian Maritime Provinces, where the values were below 29.95, the lowest reading reported, 29.94, being noted at Sydney, C. B. I. Along the extreme southern border of the United States the mean pressure fell below 30.10, except in the lower Rio Grande Valley, near Rio Grande City, Tex., where a reading of 30.16 was reported.

A comparison of the January, 1889, pressure chart with that of the preceding month, shows that along a line traced irregularly from the south New England coast northwestward to Lake Superior, thence southwestward to the middle-eastern slope of the Rocky Mountains, and from that region west-southwest to the Pacific coast in about latitude N. 35°, the mean pressure was the same. To the northward of this line there was an increase in pressure, which was most marked on the north Pacific coast, and in the Canadian Maritime Provinces, where the mean readings were more than .10 higher than in the preceding month. To the southward of the line referred to there was a decrease in pressure, the deficiencies being greatest within an area extending from Kentucky south-southwestward to southern Alabama, where they exceeded .10.

Compared with the normal pressure for January, the mean barometer readings were above the normal on the Pacific coast north of the forty-third parallel and thence east and southeast over the Rocky Mountain regions to about the one hundredth meridian, the greatest departures above the normal being noted in western Montana and the upper valley of the Columbia River, where they exceeded .10. In all other sections of the country the mean pressure was below the normal, the deficiencies being most marked at stations in Ontario, Canada, along the Atlantic coast between the thirtieth and thirty-ninth parallels, and over portions of Alabama, Mississippi, and Louisiana, where they were more than .10.

BAROMETRIC RANGES.

The monthly barometric ranges at the several Signal Service stations are given in the table of miscellaneous meteorological data. The general rule, to which the monthly barometric ranges over the United States are found to conform, is that they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. In January, 1889, the ranges were greatest over northeastern Michigan, where they exceeded 1.70. From this locality they decreased eastward to New England, where they were more than 1.50, and westward to Montana, where they were less than .80. From Montana the ranges increased to the northwestern part of Washington Territory, where they amounted to more than 1.10. Along the Atlantic coast the extreme ranges varied from .38 at Key West, Fla., to 1.57 at Eastport, Me.; between the eighty-second and ninety-second meridians, .57 at Cedar Keys, Fla., to 1.74 at Alpena, Mich.; between the Mississippi River and Rocky Mountains, .73 at Brownsville, Tex., to 1.40 at Saint Paul, Minn.; in the plateau and Rocky Mountain regions, .57 at Fort Grant, Ariz., to .95 at Salt Lake City, Utah; on the Pacific coast, .67 at Eureka, Cal., and .74 at San Diego, Cal., to 1.11 at Port Angeles, Wash.

AREAS OF HIGH PRESSURE.

Six areas of high pressure were observed during the month of January, 1889, three of which remained west of the Rocky Mountains over the plateau region, where they continued almost stationary from four to eight days, and afterwards disappeared by a gradual decrease of pressure and an apparent flow of cold air to the southern portions of the continent, resulting in the formation of areas of high pressure which moved to the Atlantic. Two areas of high pressure appeared over British America north of Montana and passed eastward over the Lake region, and thence over New England and the middle Atlantic states. The general direction of movement of these areas was to the south of east until reaching the coast line, after which they inclined to the north of east. Areas of high pressure which formed over Texas and northern Mexico, although not directly traceable to the high area over the Rocky Mountain region, formed immediately after the Rocky Mountain area had reached its maximum pressure. These areas moved northeastward from Texas to Nova Scotia, following the general direction of the coast line. One of the marked features of the month was the small number of areas of high pressure which passed over the country east of the Rocky Mountains and the prevalence of high areas over the northern plateau region which remained stationary during long periods, these two conditions resulting in abnormally high temperatures over the Northern States.

The following table exhibits, in a concise manner, some of the more prominent characteristics of the high areas:

No.	First observed.			Last observed.		Duration.	Velocity per hr.	Highest pressure.		
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Date.	Station.	Reading.
		°	°	°	°	*Days.*	*Miles.*			*Inches.*
I	*27	46	115	42	110	12.5	3.0	*31	Helena, Mont	30.94
II	9	27	100	42	72	4.0	21.9	13	Boston, Mass †	30.42
III	11	54	111	42	61	5.0	25.0	13	Q'Appelle, N. W. Ter	30.72
IV	17	54	99	49	60	3.5	23.8	19	Rockliffe, Ont	30.72
V	18	37	124	42	112	6.5	‡7.1	23	Boisé City, Idaho	30.76
Va	21	25	99	44	60	3.0	37.5	23	New York City	30.64
VI	25	53	114	41	114	6.5	§5.8	25	Q'Appelle, N. W. Ter	30.90
Means	....	.....	.....	.....	.....	5.9	17.6	....	.....	30.73

* December, 1888. † Also at several other stations in New England. ‡ During the first forty-eight hours this area moved at an average rate of 22.9 miles per hour; after the 10th it had no decided movement. § During the first twenty-four hours this area moved at an average rate of 20.8 miles per hour, after which it remained practically stationary.

I.—The month opened with an area of high pressure covering the Rocky Mountains and plateau regions, where similar conditions existed during the last days of the previous month and which continued until the 8th of January without any decided change in the position of the area of high pressure. It did not develop sufficient energy to move eastward of the Rocky Mountains, and a gradual decrease of pressure was observed in these regions from the 31st of the previous month, when the maximum pressure was observed, until it finally disappeared.

II.—Number ii formed over the lower Rio Grande valley on the 9th, to the southwest of an area of low pressure of marked energy which was then central in the upper lake region. This area of high pressure moved over the Gulf States and thence northeastward along the coast. It was apparently reinforced by the cold air from the Missouri Valley, and by morning of the 13th it extended over the eastern portion of the United States, being central in New England, where the maximum pressure attending this area was observed. After the 13th this area apparently formed a part of high area number iii which was at that time central north of Dakota and extended eastward to the Saint Lawrence Valley.

III.—Number iii appeared in British Northwest Territory on the afternoon of the 11th, when areas of low pressure existed over the central Rocky Mountain region and off the north Pacific coast. It moved slowly eastward and southward, apparently forcing the areas of low pressure to the westward over the southern plateau region and southern California, causing general snows in the region between the Mississippi Valley and plateau region, and heavy rains in Texas. After reaching the region of Lake Superior on the 14th, when it covered three-fourths of the country to the east of the Rocky Mountains, it was apparently drawn to the southward, and on the 15th it was central over the middle Atlantic states, the weather maps for that day showing a gradual easterly movement of the area of high pressure and also of the low area which had formed over Lower California and Arizona. After

reaching the middle Atlantic coast the pressure increased rapidly at stations in Nova Scotia, which indicated the northeasterly movement of this area over the ocean. A decrease of pressure was observed at the centre of this area as it moved from the centre of the continent southeastward toward the coast, while in the preceding area there was an increase of pressure during the movement toward the same point from the southwest.

IV.—This area of high pressure was at no time central within the region of observation. It followed quickly in rear of an area of low pressure which passed with considerable energy over Lake Superior on the 16th, and was first observed north of Minnesota in Manitoba on the afternoon of the 17th. It moved eastward over the lower Saint Lawrence valley, causing a cold wave in New England and New York, on the 19th and 20th. After reaching the Saint Lawrence Valley it passed eastward over the Maritime Provinces, the pressure decreasing rapidly at the centre, in advance of the storm which was then in the Lake region.

V.—On the 18th this area of high pressure was apparently central west of central California. It first moved northward along the coast to Oregon and thence southeastward over Nevada to central Utah on the 20th, when it covered the greater portions of Nevada, Utah, New Mexico, and Colorado. It remained almost stationary during the succeeding twenty-four hours, contracting, however, and apparently supplying the cold air which formed high area number v*a* in the lower Rio Grande valley on the morning of the 21st. After the formation of the last-named area the principal area moved northwestward, covering eastern Oregon and northern Nevada on the 22d, 23d, and 24th, the pressure increasing during the northwesterly movement, after which it disappeared as a distinct area and formed a part of high area number vi which appeared far to the north of Montana on the 25th.

V*a*.—Number v*a* apparently formed in the lower Rio Grande valley on the 21st when killing frosts occurred in that region. It extended rapidly northeastward over the Southern and Middle States during the 22d, and on the morning of the 23d covered the greater portion of the United States east of the Mississippi River, the pressure increasing during the easterly movement, reaching its maximum while central off the middle Atlantic coast. Reports from the Maritime Provinces indicate that this area continued its northeasterly movement after leaving the coast line, but the pressure at the centre probably diminished after the area left the coast of the United States.

VI.—Number vi appeared far to the north of Montana on the 25th. It passed directly south to the central plateau region, a portion of the area apparently moving over the upper Missouri valley on the 26th, after which it united with the principal area which was central over Idaho on the 27th, where it remained almost stationary as a well marked area of high pressure, covering the Rocky Mountain and plateau regions, until the close of the month.

AREAS OF LOW PRESSURE.

Nine areas of low pressure were observed during the month of January, and those attended by storms over the United States east of the Rocky Mountains originated in low latitudes between Florida and southern California. Areas of low pressure having their origin in the Gulf of Mexico moved northeasterly, while those originating farther to the westward inclined more to the eastward. Two areas of low pressure were observed on the north Pacific coast, both of which disappeared either on the immediate coast or before crossing the Rocky Mountains. Two areas of low pressure developed in British America north of Dakota or Montana, one of which passed over the upper lake region, attended by general snows throughout the adjoining states, while the other passed to the north of the Lake region, causing but slight changes in the weather conditions within the United States.

The following table exhibits the principal facts regarding these low areas:

No.	First observed.			Last observed.		Duration.	Velocity per h'r.	Lowest pressure.		
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Date.	Station.	Reading.
		°	°	°	°	*Days.*	*Miles.*			*Inches.*
I	3	26	90	45	65	4.5	18.5	7	Yarmouth, N. S	29.24
II	5	53	115	50	89	2.0	25.0	7	Fort Garry, Man	29.48
III	7	33	101	52	60	3.5	31.0	9	Alpena, Mich	28.82
IV	10	50	124	42	103	1.0	50.0	10	Olympia, Wash	29.65
V	11	47	130	45	123	1.0	16.7	12	Portland, Oregon	29.60
VI	13	32	119	52	70	4.5	27.8	16	P. Arthur's Landing, Ont	28.94
VII	19	34	104	50	59	3.0	36.1	22	Anticosti, Gulf of St. L.	29.22
VII*a*	19	25	98	42	71	1.5	58.3			
VIII	26	30	92	46	68	2.0	39.6	28	Eastport, Me	29.42
VIII *a*	26	34	79	46	68	1.3	29.2			
IX	29	52	100	46	75	2.0	31.2	31	Saugeen, Ont	29.54
Means.						2.9	40.4			29.32

I.—The month opened with generally fair weather which continued until the 3d, when this storm was observed in the Gulf south of New Orleans. On the morning of the 4th it was well defined and central east of New Orleans, attended by general rains throughout the Gulf States. It passed over the south Atlantic states to the middle Atlantic coast, where it was central on the morning of the 6th, the pressure decreasing rapidly during the northeasterly movement. Dangerous gales occurred on the New England and middle Atlantic coasts for which warning signals had been displayed, the wind reaching a maximum velocity of seventy miles per hour at Block Island, R. I., and forty-four miles per hour at Boston, Mass., on the 6th. These gales continued with less force during the 7th, except at Eastport where a maximum velocity of forty-eight miles per hour occurred during that day. This storm apparently attained its maximum energy when its centre was near Yarmouth, N. S., on the 7th, after which the pressure increased at the centre and the barometric gradient became less as the storm passed to the northeast of the Maritime Provinces.

II.—Number ii appeared as a feeble depression to the north of Montana on the 5th, and during the two succeeding days it moved eastward to north of Lake Superior, attended by snows at northern stations. After reaching Lake Superior it could no longer be traced as a separate area, owing, probably, to the rapid advance of a storm from the southwest which covered the central valleys on the 8th.

III.—Number iii was the most remarkable storm of the month, owing to the great energy it developed while passing over the central and northern portions of the United States; and the violent local storms which occurred in its southeast quadrant, while the centre was passing from the Mississippi Valley toward Lake Huron, resulted in great loss of life and property. It was first observed as a slight disturbance central in Texas on the afternoon of the 7th, and by the afternoon of the 8th it covered the central valleys, being central near Cairo, Ill., its general form being that of an ellipse with its longer axis pointing directly northward. On account of the unusual violence of the numerous local storms which attended this disturbance, the Signal Service weather maps of the 8 a. m. and 8 p. m. telegraphic reports of the 9th are published with this REVIEW, the charts exhibiting lines of equal barometric pressure, isothermal lines, direction of wind, and the track of the general storm for the hours named, from which may be determined the approximate position of the storm-centre at the hours when the severe local storms occurred. During the 9th, when this storm was most destructive in the middle Atlantic states and Lake region, its centre was passing almost directly northward from southwest Michigan to the northern portion of Lake Huron. After leaving the Lake region its course changed and inclined more to the eastward, disappearing to the northeast of the Gulf of Saint Lawrence on the afternoon of the 11th. The following special reports received from Signal Service and voluntary observers and from other sources are of interest:

Toledo, Ohio, 9th: at 11 a. m. the wind blew from the southwest at the rate of thirty-six miles per hour; it increased in force until 11.35 a. m., and from that time until 7.30 p. m. blew at the rate of forty-eight miles per hour, the maximum velocity being fifty-five miles per hour; after 7.30 p. m. the wind

decreased in force. No serious damage occurred. The water in Maumee River was lower on this day than ever before known, the river bed from the the Ohio Central dock to Pennsylvania bridge being entirely dry during the storm.

Pittsburgh, Pa., 9th: a violent gust of wind from the southwest set in at 12.30 p. m., increased in force until 12.44 to 12.46 p. m., when a velocity of forty miles per hour was registered, and ended at 1.35 p. m. During the height of the gale the wind-vane oscillated violently, and several times described a complete circle. The storm was apparently a violent gale, having none of the characteristics of a tornado. An unfinished structure of seven stories was completely demolished, carrying with it in its fall portions of other buildings. Forty-nine persons were injured and fifteen killed. An unfinished building in another portion of the city was also wrecked and one man killed. About twelve buildings in Allegheny City and Pittsburgh were unroofed or otherwise damaged; estimated loss from the storm, $165,000.

Harrisburg, Pa., 9th: light and heavy rain fell at intervals, with light south to east winds up to 4.13 p. m., at which time the wind changed suddenly and blew from the west with great violence. The severest part of the storm occurred at 4.18 p. m., at which time the anemometer cups, with attachment, were carried away by the wind, hence the maximum velocity of the wind can only be estimated, and must have reached fully one hundred miles for two or three minutes. Much damage was done to property, shade trees, telegraph and telephone wires, and the streets were strewn with roofs, awnings, and débris of various kinds. The storm, which came from due west, struck the Susquehanna River, sweeping the water up in a wave thirty feet high. At that time the barometer was observed very closely and was actually seen to take a sudden upward jump of 0.2 of an inch: the wind continued high into the night and the rain ceased at 5.40 p. m. The storm was preceded by high temperature and a distinct roar like distant thunder.

Reading, Pa., 9th: a cyclone visited the northern part of this city this evening about 5.40 o'clock, and its track was marked by a series of terrible disasters seldom equalled in the history of such visitations. The cyclone lasted but a moment; it swept across the city from west to east, unroofing factories, mills, and houses, uprooting trees, and overturning nearly everything in its course. The large paint shops of the Philadelphia and Reading railroad were demolished, and in a moment the combustible materials contained therein were a mass of flames. A few squares from there it struck the Reading Silk Mill, a large, new five-story building in which some 300 girls and boys were working, and crushed the huge building like an egg-shell before a single person could escape. The building was leveled to the foundations and all the people went down in the midst of a great heap of beams, bricks, and twisted machinery. The path of the cyclone was from 60 to 100 feet wide, and it was fortunate that it passed through a portion of the city that was not entirely built up, else the loss would have been well-nigh incalculable. As it is, its path is strewn with wreckage. The Mount Penn Stove Works were unroofed and considerable damage done to the building. The cyclone struck the large nut and bolt works of J. H. Sternberg & Son with great force, carrying away the immense roof of the main building. On North Ninth street it cut a clean swath through a row of new houses, unroofing nine of them. The storm's actions were most peculiar. In many cases the damage done was such as would be accomplished by an ordinary high wind, but in others it seemed to crush from above. This was notably the case at the silk mill. Witnesses of its demolishment say that the building went down all in a heap as if a huge weight had dropped upon and smashed it. A curious circumstance is that the high stack of the mill, which was at one corner, is still standing, and is not even shattered.—*The (Philadelphia) Press, January 10th.*

"The (Philadelphia) Times" of the 11th gives the number of persons killed by the Reading storm as forty.

Philadelphia, Pa., 9th: at 8.30 a. m. the wind changed to southeast and the rain was renewed, lasting until 1.45 p. m. A few minutes before 10 a. m. there was a sudden fall of 0.1 inch in the barometer within five or ten minutes. The barometer reached its lowest point, 29.15 (actual), at 6.15 p. m., when it began to rise rapidly; the wind at this hour veered to the northwest, and at 6.40 p. m. the temperature fell almost instantly 13°—from its maximum to nearly its minimum. At this time the storm passed the eastern edge of Camden, N. J., and caused damage over an area of less than five blocks, amounting to $5,000. The whirlwind came from a southwesterly direction and moved to the northeast; eight houses were unroofed and numerous fences demolished. The storm took a course across some vacant lots, where the force of the wind was well illustrated, a large section of an ice-house roof having been carried east across the railroad and thrown against a row of brick houses. The whole front of one building was crushed in and that of another was badly damaged. There was no loss of life. During the passage of the tornado rain fell in torrents.

East Brady, Clarion Co., Pa., 10th: a terrific hail storm passed over this place at 2 o'clock yesterday. The storm was the most violent here in years.—*Leader, January 10, 1889, Pittsburgh, Pa.*

Buffalo, N. Y.: the storm which began during the forenoon of the 9th continued throughout that and the following day; the high wind caused the heavy falling snow to drift badly and the débris of outhouses, skylights, parts of roofs, fences, etc. were strewn over the streets, detaining the street cars several hours. The actual velocity of the wind was seventy-eight miles per hour at 7.26 a. m., 10th, and the average hourly velocity for forty-eight hours was 49.1 miles. The lake which was free from ice rose 7.8 feet above high water mark, flooding the Island during night of 9–10th and rendering its entire population, about twenty families, homeless. The New York Central Railroad track near Porter avenue was completely washed out as well as the "Belt line" route. The gale was the severest experienced since the establishment of the Signal Service station in 1870.

Humphrey, Cattaraugus Co., N. Y., 9–10th: at 4.30 p. m. the wind changed from southeast to southwest and began to blow a gale which increased during night and continued until 9 a. m., 10th, unroofing buildings; numerous oil-derricks were blown down twenty miles south of this place.

Mr. William A. Eddy, of New York City, makes the following report relative to the storm which visited Brooklyn, N. Y. on the 9th: "Brooklyn, N. Y., January 9, 1889, 7.40 p. m. (seventy-fifth meridian time); course of storm from southwest to northeast, but along a decidedly northerly course; width of path five hundred to six hundred feet; length of path, two miles at least; velocity of storm, fifty to sixty miles an hour; shortest time in passing a given point, ten seconds; form of cloud not seen, owing to darkness; direction of whirl in cloud, right to left, or against the motion of the hands of a watch; temperature preceding storm, not ascertained; temperature following storm, not noticeably cooler; direction of destructive winds, from the southwest; rain just before; no hail; characteristics of formation of cloud not observed, owing to darkness; no electricity in cloud and no thunder. It first struck a new building in South Brooklyn, facing the open water in Gowanus Bay, and its roaring was heard ten or fifteen minutes in advance of its arrival. After striking the building it remained near enough to the ground to lift here and there a roof, or to blow down fences, and created strong earth currents that caused some trifling damage. The funnel did not approach very near the ground, however, until it reached some gasometers of the Citizens' Gas Co., when it lifted the gasometer nearest the southwest approach of the tornado track. The iron pillars, not less than two feet in diameter and perhaps forty feet high, were thrown principally in a northerly direction, one or two of those nearest the tornado track being thrown in a westerly direction, thus showing clearly enough the whirl of a tornado. The funnel then bounded into the air and exerted severe local currents here and there near the ground, in some cases the ground currents being strong enough to break large plate-glass windows. It was thought at first that this breakage of large windows was due to the explosion of the gasometers, but an examination in other directions aside from the tornado track revealed that no windows at like distances were broken. A number of roofs, chimneys, and bits of upper brick work were torn off, now and then, as the funnel here and there dipped a little lower. This variation of lighter destruction, principally in the upper parts of buildings, continued for nearly two miles. When the tornado came within about one-fourth of a mile from the Navy-Yard it began to descend toward the earth, taking off not only some roofs but several feet of brick wall, the bricks of which and of chimneys were mostly never found. It then lifted for another stretch, perhaps one-eighth of a mile, and passed over one building with a high cupola before descending upon the Navy-Yard gate leading to the Marine Barracks. It tore down a high tree about three feet in diameter at the left of the gate, throwing the tree west of north. The suction upon the double gate leading to the barracks was so strong that an inner gate of the two was torn out and thrown north and west, its huge hinge before giving way partly turning round a large stone pillar supporting the masonry of the structure, which is a sort of porter's lodge with rooms in the upper story. A curious result of this, showing powerful suction, was that the outer of the two gates was not injured. In the barracks the structure was torn away for a length of about five hundred feet. The walls of brick were not destroyed lower than ten or twelve feet from the ground, except by leverage of timbers or débris in motion. The roof of the barracks and its timbers were mostly ground into pieces, some fragments, however, being as much as ten feet square. Most of the brick work seemed to have disappeared. The timber and roof fragments remaining were scattered in a half circle, first northerly, then westerly, then southerly back against the barracks. One of the largest pieces of roof cut this circle, followed part of the way around by smaller fragments. Some of the tin roof was carried a long distance northeast, then west, and scattered into fragments which were rolled into wads. The fragments from the barracks did not seem to be scattered in very great quantities along the northeast course of the tornado, many of them, however, seemed to have disappeared. After leaving the barracks the tornado track led over the East River, and there vanished as far as I know at the present writing. It seems probable, from conditions observed, that a funnel might have moved high in air over New York City."

The Signal Service observer at New York City reports, "that high southeasterly winds prevailed during the day of the 9th, shifting to westerly during the evening and increasing in force. At about 7 p. m. the clouds assumed a tornado formation, which, passing over the city, struck South Brooklyn with great violence, unroofing houses, completely demolishing several, and blowing down fences and trees. It was also the direct cause of an explosion of one of the largest gas tanks in Brooklyn. This loss is estimated at $200,000. The tornado moved from south to northeast; its path was well-defined, and houses were unroofed over its entire course. The damage will probably reach $500,000."

The telegrams issued as warnings to land stations and to the lake and sea-ports in advance of this storm are as follows:

WASHINGTON, D. C., *January* 9, 1889.

To observers: Norfolk; Norfolk section; Fort Monroe; Baltimore; Breakwater; Atlantic; Sandy Hook and New York.

Hoist storm southeast at 10.15 a. m. Severe storm, central near Chicago, moving northeast. Southeast winds, with rain, followed Thursday by westerly winds and much colder, clearing weather.

GREELY.

WASHINGTON, D. C., *January* 9, 1889.

To observers: Jacksonville; Jacksonville section; Savannah; Savannah section; Charleston; Wilmington; Wilmington section; Morehead City.

Hoist cautionary southwest at ten fifteen a. m. Storm-centre near Chicago, moving northeast. Winds veering to westerly with much colder, clearing weather.

GREELY.

WASHINGTON, D. C., *January* 9, 1889.

To observers: Norfolk; Norfolk section; Fort Monroe.

2 p. m., change to storm southwest. Storm-centre near western Lake Erie, moving eastward. Winds veering to westerly with colder, clearing weather.

GREELY.

WASHINGTON, D. C., *January* 9, 1889.

To observers: New Haven; New London and Newport section; Narragansett section; Wood's Holl section; Boston, Boston section; Portland; Portland section.

Hoist storm southeast at two fifteen p. m. Storm-centre near western Lake Erie, moving eastward. Heavy rain, warmer and high southeast winds, followed Thursday by clearing, much colder and high westerly winds.

GREELY.

WASHINGTON, D. C., *January* 9, 1889—3.10 *p. m.*

To observers: New York; New Haven; New London; Newport section; Narragansett section; Wood's Holl; Wood's Holl section; Boston; Boston section; Portland; Portland section; and Secretary Maritime Exchange, New York.

The storm-centre over Lake Erie is increasing in intensity and moving nearly due east. It is accompanied by violent local winds which may possibly continue as it moves eastward.

GREELY.

WASHINGTON, D. C., *January* 9, 1889.

To observers: New Orleans; Mobile; Pensacola; Cedar Keys.

Change storm to cautionary northwest, and signal down at sunset. Storm centre near Chicago, moving northeast. Colder, clearing weather.

GREELY.

WASHINGTON, D. C., *January* 9, 1889—9.02 *p. m.*

To observer: Eastport.

9.05 p. m. Hoist storm southeast. Severe storm central over Lake Huron, moving eastward. Heavy rains with southerly winds shifting to westerly during Thursday.

GREELY.

IV and V.—Numbers iv and v appeared on the north Pacific coast on the 10th and 11th, respectively, and after developing considerable energy were forced to the southward and westward by an extended area of high pressure, and both disappeared without passing to the eastward of the Rocky Mountains. The movement of these areas is shown on chart i.

VI.—This was the only storm of the month which passed from the Pacific coast eastward to the Saint Lawrence Valley. It was probably central near San Diego, Cal., on the morning of the 13th, after which it moved slowly over southern California, Nevada, Utah, and western Colorado, where it was central on the 15th. After the morning of the 15th the easterly movement became accelerated and by morning of the 16th the storm was central in southern Minnesota. It increased in force as it passed over Lake Superior, the barometer reaching the minimum on the afternoon of the 16th, at Prince Arthur's Landing, when the centre was near that station. The area of precipitation included the whole country east of the Rocky Mountains, the rains being very heavy in the Gulf States, Tennessee, and the Ohio Valley. Westerly gales were severe in the Lake region, and the wind attained maximum velocities ranging from forty to fifty miles per hour along the middle Atlantic and New England coasts on the 17th, when the centre was passing from the Lake region to the Saint Lawrence Valley.

VII.—This storm was first observed as central in eastern New Mexico on the 19th, but the reports of the preceding day showed that an extended barometric trough covered the central Rocky Mountain region and on the 17th an area of low pressure appeared on the north Pacific coast. As this barometric trough moved eastward two distinct centres of disturbance were observed, one over the Gulf, and the other in the central Mississippi valley on the 20th. The disturbance farthest northward moved over the Lake region while that in the Gulf moved along the south Atlantic coast, and the two united in southern New England, causing dangerous easterly gales which were followed quickly by winds shifting to westerly during the 21st, as the storm passed northeastward as a single disturbance. The strongest gales occurred on the northern New England coast, the wind reaching a velocity of sixty-four miles per hour at Eastport, Me., on the 21st. The pressure continued to decrease during the northeasterly movement and gales continued at northern Maritime stations on the 22d.

VIII.—From the 22d to the 25th an area of low pressure existed over the Rio Grande Valley and west Gulf, but the reports were not sufficient to justify the location of the centre of disturbance until the morning of the 26th, when it was near, and to the west of, New Orleans. General rains prevailed throughout the Southern States and light snows in the upper lake region and Northwest; a second depression was central in the Lake region and a cold wave in the Missouri Valley. This storm moved rapidly towards the Ohio Valley while a secondary disturbance developed on the south Atlantic coast, both moving northeastward over parallel lines until they reached northern New England where they united and the pressure reached its minimum. The rains were generally heavy in the Southern States and Ohio Valley, and the storms were followed quickly by a cold wave which caused snow as far south as the Gulf States. The snow being light, it quickly disappeared, leaving the ground generally bare to the south of the fortieth parallel. After these two storms united the resulting disturbance was feeble, and it was difficult to trace its movements after the union.

IX.—This storm appeared north of Manitoba on the 29th and moved southeastward to Wisconsin, causing general snows in the Lake region, Minnesota, and Dakota, on the 29th and 30th. After reaching the Lake region the barometer continued to fall at the centre and the direction changed to the eastward, the storm centre passing over Lake Huron, after which it passed to the Saint Lawrence Valley where it was central at the close of the month.

NORTH ATLANTIC STORMS FOR JANUARY, 1889 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during January, 1889, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels, received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Eight depressions have been traced, of which four were continuations of storms which first appeared over the American continent; two apparently developed over mid-ocean; one is given a probable track eastward from off the Labrador coast, and one moved east-northeast from the vicinity of the Bahamas, over or near Bermuda, and disappeared over the ocean west of the Azores. The depressions pursued normal east-northeast to northeast tracks, except number 1, which assumed a southerly course over mid-ocean, and number 7, which passed southeastward over Newfoundland during the 18th and 19th. But one storm is traced over the ocean south of the forty-fifth parallel, although three depressions advanced along the immediate coast of the United States. Over the eastern part of the ocean generally fair weather prevailed, except from the 7th to 16th, inclusive, when low and fluctuating pressure and gales of varying force were reported. Over mid-ocean unsettled weather prevailed during the first two decades, while during the last ten days of the month the pressure continued generally high, and no storms of marked violence were noted. To the westward of the fiftieth meridian stormy weather prevailed from the 1st to 3d, 6th to 13th, 18th 22d, and 28th to 30th.

In January, 1888, nine depressions were traced, of which six advanced eastward from the American continent north of the fortieth parallel; one developed over mid-ocean between the

fortieth and forty-fifth parallels, and moved east-northeast to the British Isles; one was given an approximated track from the vicinity of the Azores southwestward to the thirty-ninth meridian, and thence northward, and one passed south of east over the British Isles. Six of the depressions pursued normal paths.

In January, 1889, the depressions numbered two less than the average for the preceding six years, and were, as a whole, deficient in energy. The lowest barometer readings were noted over mid-ocean on the 16th, when the minimum apparently fell to about 29.00 (737).

Storms of considerable strength occurred off the coast of the United States, attending the passage of low areas i, vii, and viii*a*. Two depressions, numbers 3 and 4, traversed the ocean from coast to coast.

The following are brief descriptions of the depressions traced:

1.—This depression advanced eastward from off the Labrador coast, and on the 2d was central in about N. 55°, W. 38°, with strong to whole gales to the fortieth parallel. By the 3d the storm-centre had moved slowly eastward with an appreciable decrease in energy, and by the 4th had recurved southward to the fifty-first parallel, after which it passed northeastward beyond the region of observation, with an apparent increase in strength.

2.—This depression first appeared over mid-ocean on the 6th, whence it moved east-northeast and disappeared north of the British Isles after the 7th. The depression augmented in energy during its passage, and on the 8th barometric pressure falling below 29.20 (741.7) was reported off the south and west coasts of Ireland.

3.—This depression was a continuation of low area i, which moved from the Gulf of Mexico, where it was central on the morning of the 4th, to Nova Scotia by the 8th, attended from the 6th to 8th, inclusive, by fresh to strong gales north of the thirtieth parallel. By the 9th the centre of disturbance had advanced to the east of Newfoundlond, and from that locality passed rapidly east-northeast to the vicinity of the thirtieth meridian by the 10th, after which it apparently recurved to the south of east and disappeared over the British Isles.

4.—This depression was a continuation of low area iii, which acquired remarkable intensity during its passage over the Lake region on the 9th, and passed thence to the north of the Gulf of Saint Lawrence by the 11th. On the morning of the 12th the storm was central northeast of Newfoundland, without evidence of marked energy, whence it moved east-northeast and disappeared over the British Isles after the 15th, attended throughout by gales of moderate strength.

5.—This depression appeared about midway between the Bahamas and Bermuda on the 14th, whence it advanced east-northeast to about the sixtieth meridian by the 15th, after which its course cannot be accurately determined, owing to an absence of reports from the region west of the Azores. It is not improbable, however, that the storm-centre moved rapidly northeastward, and that number 6 was its continuation. The depression evidently possessed marked energy, as gales of hurricane force were encountered near its path on the 14th.

6.—This depression apparently developed over mid-ocean near the fiftieth parallel on the 16th, and thence moved northeastward and disappeared north of the region of observation after the 17th, attended by fresh to strong gales, and on the 16th by pressure falling to about 29.00 (737), the lowest readings reported during the month.

7.—This depression was a continuation of low area vi, and moved from north of the Gulf of Saint Lawrence southeastward over Newfoundland, where it was central on the 19th. During the following two days the storm-centre advanced eastward, and after the 21st apparently dissipated over mid-ocean, having shown a gradual decrease in energy after leaving Newfoundland.

8.—This depression was a continuation of low area viii and viii *a*, which caused gales of considerable violence off the middle Atlantic and New England coasts during the 27th and 28th. On the 29th the storm was central over the Gulf of Saint Lawrence, and by the 30th advanced northeast over Newfoundland, after which it disappeared north of the region of observation.

OCEAN ICE IN JANUARY.

No ice was reported during the month. In January, 1888, two bergs, one very large, were observed in N. 45° 20, W. 50° 01′, on the 31st, and an ice bank was seen to the northward of that position. In January, 1887, a medium-sized berg was reported in N. 48° 30′, W. 46° 00′, on the 30th. In January, 1886, several icebergs were reported off the southeast coast of Newfoundland. In January, 1885, icebergs were reported between W. 45° 30′ and W. 42° 24′, none being observed south of the forty-seventh parallel. In January, 1884, icebergs were observed about four degrees farther west, and eleven days later (on the 24th) than in January, 1885. In January, 1883, the first icebergs were seen in N. 47° 35′, W. 45° 04′ on the 30th, and in the corresponding month of 1882 the first icebergs were reported in N. 47° 30′, W. 48° 35′, on the 30th.

From the above it will be seen that the entire absence of Arctic ice in the vicinity of Newfoundland during January, 1889, constituted an unusual feature.

FOG IN JANUARY.

The following are limits of fog-areas on the north Atlantic Ocean during January, 1889, as reported by shipmasters:

Date.	Entered.		Cleared.		Date.	Entered.		Cleared.	
	Lat. N.	Lon. W.	Lat. N.	Lon. W.		Lat. N.	Lon. W.	Lat. N.	Lon. W.
	° ′	° ′	° ′	° ′		° ′	° ′	° ′	° ′
5	42 40	59 16	42 32	61 07	18	33 45	77 26	35 25	76 12
7	42 38	61 37	42 25	62 15	18–19	42 50	60 23	42 38	62 16
7	40 16	69 00	40 22	69 25	18–19	43 00	60 00	43 00	64 00
7	42 01	62 26	41 54	62 51	18–19	43 45	56 31	42 58	59 27
8	44 28	53 39	43 33	56 50	20	31 46	80 20	32 05	80 25
8	44 45	61 52	Halifax harbor.		20	47 25	47 30	46 40	49 10
9	45 28	49 40	44 35	52 55	23–24	Halifax harbor.		Halifax harbor.	
9	46 56	46 48	46 50	47 12	26–27	37 10	74 32	37 24	76 36
9–10	45 00	46 10	43 30	54 30	27	40 40	68 15	40 35	69 00
10	45 56	49 49	45 02	52 04	27	39 18	74 28	40 27	73 58
10	44 03	55 03	44 00	55 12	27	43 34	64 29	20′ e. Cape Cod Lt	
10	47 27	43 58	47 05	44 54	27	37 30	74 45	35 30	75 10
10–11	46 16	47 38	46 00	48 34	28	45 24	58 17	45 05	59 23
					28	43 18	59 00	43 12	60 45

The limits of fog-belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on five days, as compared with nine days for December, 1888, and nine days for January, 1888. Between the fifty-fifth and sixty-fifth meridians fog was reported on ten days, as compared with four days in December, 1888, and two days in January, 1888. To the westward of the sixty-fifth meridian fog was reported on five days, as compared with three days in December, 1888, and seven days in January, 1888. As compared with the preceding month a decrease in fog frequency is shown near the Newfoundland Bank, while to the westward of the fifty-fifty meridian there has been a marked increase. The southern limits of fog remain materially the same, except along the immediate coast of the United States, where, in January, 1889, it was reported as far south as the thirtieth parallel. On the 8th a dense fog occurred at Jacksonville, Fla., which continued from the early morning until 9 a. m.

On the several dates on which fog was reported over or near the Banks of Newfoundland the general meteorological conditions were as follows: 8th, storm central over Nova Scotia, south to east winds and fog over the Grand Banks; 9th, storm-centre passed east-northeast over the southern extremity of Newfoundland and the northern part of the Banks, attended by fog in the southeast quadrant; 10th, storm of great strength central in the Saint Lawrence Valley, south to east winds and fog south of Newfoundland; 11th, storm central north of Newfoundland, and fog over the Banks; 20th, storm central east of the southern extremity of Newfoundland and fog over the Grand Banks. To the south and southeast of Nova Scotia fog attended the approach or passage to the

northward of areas of low pressure, except on the 23d and 24th, when high pressure and variable winds prevailed. To the westward of the sixty-fifth meridian the following conditions attended the development of fog: 7th, storm central off New England coast, fog to the southward in the trans-Atlantic tracks; 18–19th, storm of considerable strength passed over the Gulf of Saint Lawrence and Newfoundland, fog off the coast and along the trans-Atlantic tracks between the sixtieth and sixty-fifth meridians; 20th, fog off the coast of Georgia, with easterly winds, and storm central over the Gulf of Mexico; 26–27th, fog off the middle Atlantic coast, storm moving northeast over the south and middle Atlantic states.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for January, 1889, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperatures and the departures from the normal are given for stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature show the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above.

The mean temperature was highest over southern Florida, where it rose to 70° at Key West. Along the Atlantic coast south of the thirty-fourth parallel, at stations on the east, middle, and west Gulf coast, over southern California and southwestern Arizona, at San Francisco, Cal., and in the Sacramento Valley between Red Bluff and Sacramento, mean values rising above 50° were reported. The lowest mean temperatures were recorded in Manitoba where they fell below 5°. The mean temperature fell below 10° over northwestern Minnesota, northern Dakota, northeastern Montana, and at stations along or near the eastern limit of the middle plateau region of the Rocky Mountains. To the northward of a line traced from the New England coast north of Boston, Mass., south-southwestward to southern New Mexico, and to the eastward of this line continued irregularly northwestward to north-central California, and thence northward through central Oregon and Washington, the mean temperature fell below 32°.

The mean temperature was generally above the normal along the immediate Pacific coast from British Columbia to Lower California, and over all districts east of the Rocky Mountain regions, except at stations in southern and western Texas, and over eastern and southern Florida, where slight deficiencies were shown. The greatest departures above the normal were noted at stations in northern Minnesota and northern Dakota, and the British Possessions to the northward, where they exceeded 10°, from which region they become gradually less marked eastward and southward. Along the Pacific coast the departures above the normal were very small. Over a greater portion of the Rocky Mountain region the mean temperature was deficient, the greatest departures below the normal occurring in the middle plateau district, where they amounted to more than 5°, the greatest deficiency being noted at Winnemucca, Nev.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.	°	Below normal.	°
Saint Vincent, Minn	15.7	Winnemucca, Nev	11.4
Duluth, Minn.	13.6	Salt Lake City, Utah	6.6
Bismarck, Dak	12.7	Boisé City, Idaho	6.1
Escanaba, Mich	11.4	El Paso, Tex	2.5
Saint Paul, Minn	10.2	Santa Fé, N. Mex	2.4

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for January, 1889; (4) the departure of the current month from the normal; (5) and the extreme monthly means for January during the period of observation and the years of occurrence:

State and Station.	County.	(1) Normal for the month of Jan.	(2) Length of record.	(3) Mean for Jan., 1889.	(4) Departure from normal.	(5) Extreme monthly mean temperature for January.			
						Highest.	Year.	Lowest.	Year.
Arkansas.		°	Years	°	°	°		°	
Lead Hill	Boone	30.6	7	38.1	+7.5	38.5	1882	24.2	1886
California.									
Sacramento	Sacramento	46.9	23	43.7	−3.2	52.7	1873	39.4	1868
Colorado.									
Fort Lyon	Bent	23.7	19	19.5	−4.2	32.3	1880	13.0	1875
Connecticut.									
Middletown	Middlesex	24.1	21	32.6	+8.5	32.6	1889	17.3	1888
Florida.									
Merritt's Island	Brevard	61.0	6	61.0	0.0	67.1	1885	55.3	1886
Georgia.									
Forsyth	Monroe	47.6	15	49.2	+1.6	59.4	1880	40.8	1884
Illinois.									
Peoria	Peoria	24.0	33	30.6	+6.6	40.9	1880	13.5	1857
Riley	McHenry	17.4	33	24.0	+6.6	33.2	1880	5.3	1873
Indiana.									
Vevay	Switzerland	30.4	23	37.0	+6.6	47.2	1880	23.0	1884
Iowa.									
Cresco	Howard	8.3	17	17.6	+9.3	26.1	1880	− 1.3	1883
Monticello	Jones	15.5	20	22.3	+6.8	32.9	1880	6.0	1883
Logan	Harrison	17.5	15	24.1	+6.6	34.4	1880	7.1	1886
Kansas.									
Lawrence	Douglas	26.3	26	30.3	+4.0	41.2	1880	14.3	1886
Wellington	Sumner	24.7	9	33.4	+8.7	40.4	1880	17.6	1886
Louisiana.									
Mount Pleasant	Tensas	47.3	9	47.3	0.0	57.9	1880	38.5	1886
Maine.									
Gardiner	Kennebec	17.7	48	26.7	+9.0	26.7	1889	7.1	1844
Maryland.									
Cumberland	Allegany	29.4	30	34.7	+5.3	39.0	1880	19.6	1865 '67
Massachusetts.									
Amherst	Hampshire	23.1	53	32.3	+9.2	32.3	1889	13.5	1857
Newburyport	Essex	23.8	13	32.7	+8.9	33.1	1880	13.7	1857
Somerset	Bristol	25.8	16	34.2	+8.4	35.7	1880	19.4	1888
Michigan.									
Kalamazoo	Kalamazoo	20.3	13	29.3	+9.0	36.0	1880	14.0	1881
Thornville	Lapeer	20.8	12	29.0	+8.2	35.6	1880	15.6	1881
Minnesota.									
Minneapolis	Hennepin	7.8	24	20.2	+12.4	23.2	1880	− 4.4	1875
Montana.									
Fort Shaw	Lewis & Clarke	15.8	19	24.2	+8.4	29.1	1872	− 2.2	1875
New Hampshire.									
Concord	Merrimack	20.6	24	29.2	+8.6	29.2	1889	13.2	1857
New Jersey.									
Moorestown	Burlington	28.9	15	35.5	+6.6	38.7	1880	22.2	1867
South Orange	Essex	28.0	18	33.6	+5.6	37.6	1880	23.8	1864
New York.									
Cooperstown	Otsego	19.8	35	27.0	+7.2	31.6	1880	10.3	1857
Palermo	Oswego	20.3	35	28.0	+7.7	29.4	1863 '80	11.6	1888
North Carolina.									
Lenoir	Caldwell	35.5	17	38.1	+2.6	46.0	1880	30.2	1882
Ohio.									
N'th Lewisburgh	Champaign	27.2	57	33.6	+6.4	41.0	1880	14.0	1856 '57
Wauseon	Fulton	22.2	19	29.4	+7.2	37.7	1880	12.2	1875
Oregon.									
Albany	Linn	37.3	11	40.0	+2.7	43.8	1887	22.8	1868
Eola	Polk	37.3	18	38.0	+0.7	42.7	1874	29.7	1875
Pennsylvania.									
Dyberry	Wayne	20.4	24	(1)	(1)	30.7	1880	13.9	1865
Grampian Hills	Clearfield	22.3	24	28.8	+6.5	35.0	1880	16.1	1867
Wellsborough	Tioga	24.1	9	30.0	+5.9	35.2	1880	19.1	1884
South Carolina.									
Statesburgh	Sumter	44.1	7	46.8	+2.7	49.8	1882	39.0	1886
Tennessee.									
Austin	Wilson	36.4	20	40.4	+4.0	53.1	1880	26.2	1884
Milan	Gibson	32.1	5	39.5	+7.4	39.5	1889	27.5	1886
Texas.									
Fort Concho	Tom Green	43.3	15	46.3	+3.0	58.5	1880	35.8	1885
New Ulm	Austin	50.0	15	51.4	+1.4	63.7	1880	34.8	1875
Vermont.									
Strafford	Orange	14.9	15	25.4	+10.5	25.4	1889	6.9	1888
Virginia.									
Bird's Nest	Northampt'n	39.2	20	41.2	+2.0	49.4	1880	33.7	1881
Wytheville	Wythe	35.6	23	36.0	+0.4	44.0	1880	29.0	1884
West Virginia.									
Helvetia	Randolph	31.6	11	35.2	+3.6	43.1	1880	26.1	1884
Wisconsin.									
Madison	Dane	16.4	26	22.6	+6.2	33.6	1880	4.1	1873
Washington.									
Fort Townsend	Jefferson	39.2	17	38.3	−0.9	35.4	1888	29.6	1869

(1) Report not received.

MAXIMUM AND MINIMUM TEMPERATURES.

The highest temperatures for the month were reported along the east coast of southern Florida, and in southeastern Texas west of the coast line, where the values rose above 80°, the highest reading, 88°, being noted at Rio Grande City, Tex. At Kitty Hawk, N. C., at stations in the south Atlantic states, over the southern parts of the eastern and middle Gulf states, and a greater portion of Texas, in the vicinity of Eureka, Cal., and in southern California and southwestern Arizona, the readings rose to, or above, 70°. From northern New England westward to the one hundred and seventh meridian, and in the Rocky Mountain regions west of that longitude southward into New Mexico and Arizona, the maximum temperatures fell below 50°, except in north-central Montana, where 51° and 52° were reported at Fort Assinaboine and Fort Maginnis, respectively. At Albany, N. Y., Saint Paul, and Saint Vincent Minn., and Fort Canby, Wash., the maximum temperatures were higher than for any previous January during the periods of observation, by 3°, 3°, 9°, and 2°, respectively. At Albany the highest temperature previously noted occurred in 1876, at Saint Paul and Saint Vincent in 1885, and at Fort Canby in 1888. The most notable deficiencies were reported along the eastern slope of the Rocky Mountains, where at stations the maximum temperatures were from 20° to 30° below the maximum values for the corresponding month of previous years.

The lowest temperatures occurred in the valley of the Red River of the North, where a reading of —36 was noted at Saint Vincent, Minn. Over northern New England and northern New York, Wisconsin, except near the west coast of Lake Michigan, the upper Mississippi and Missouri valleys north of the forty-first parallel, the plateau regions of the Rocky Mountains southward into central Arizona, except near Salt Lake City, Utah, and in the valleys of the Snake and Columbia rivers, the temperature fell below zero. Unusually low temperatures have not been reported, and the minimum readings were above the lowest values previously reported for January in the several districts as follows: New England 14° to 25°, middle and south Atlantic states 17° to 37°, Gulf states 11° to 25°, Lake region 20° to 31°, Ohio, upper Mississippi, and lower Missouri valleys, and Tennessee 24° to 37°, above the minimum temperatures of 1884; in the middle and northern Rocky Mountain regions, 22° to 44°; on the north Pacific slope, 14° to 32°; on the middle and southern Pacific slopes, and in southern Rocky Mountain regions, generally less than 15°.

The table of comparative maximum and minimum temperatures heretofore published in the REVIEW has been discontinued, as similar data for the regular stations of the Signal Service will be published in the table of miscellaneous meteorological data, commencing with the current month.

RANGES OF TEMPERATURE.

The monthly and the greatest and least daily ranges of temperature at Signal Service stations are given in the table of miscellaneous meteorological data. The greatest monthly ranges occurred in the valley of the Red River of the North, where they exceeded 80°. In north-central Montana they were more than 70°, while in northern Vermont, southeastern Iowa, central Colorado, the upper Missouri valley, and at stations in the middle and southern plateau regions they ranged above 60°. The monthly ranges were least over the southern extremity of Florida, west-central California, and the western part of Washington Territory, where they were less than 30°. Along the middle and west Gulf coasts, in southwestern Ohio, in the vicinity of Salt Lake City, Utah, over a greater portion of California and Washington Territory, and in northwestern Oregon, the ranges were less than 40°.

The following are some of the extreme monthly ranges:

Greatest.	°	Least.	°
Saint Vincent, Minn.	84.0	Pysht, Wash.	22.0
Moorhead, Minn.	75.0	San Francisco, Cal	24.0
Fort Assinaboine, Mont.	72.0	Port Angeles, Wash.	24.0
Huron, Dak.	67.0	Key West, Fla.	25.0
Northfield, Vt.	67.0	Cincinnati, Ohio.	39.0
Winnemucca, Nev.	63.0	Salt Lake City, Utah.	39.0

FROST.

Frost occurred in the south Atlantic and Gulf states as follows: 1st, Tex; 2d, Ala., Tex.; 3d, Ala., Ga., La., Miss., S. C., Tex.; 4th, S. C., Tex.; 5th, Ala., La., Miss., Tex.; 6th, Ala., La., Miss., S. C., Tex.; 7th, Ala., Ga., La., Miss., S. C.; 8th, Ala., Ga., S. C.; 9th, Ala., Ga., S. C., Tex.; 10th, Ala., Ga., La., Miss., S. C., Tex.; 11th, Ala., Ga., La., S. C., Tex.; 12th, Ala., Ga., La., Miss., S. C., Tex; 13th, Ala., Ga., La., Miss., S. C., Tex.; 14th, Ala., Ga., Miss., S. C.; 15th, Ga., S. C., Tex.; 17th, La., Tex.; 18th, 19th, Tex.; 20th, Ala., La., Tex.; 21st, Ala., Ga., La., Miss., Tex.; 22d, Ala., Ga., La., Miss., S. C., Tex.; 23d, Ala., S. C., Tex.; 24th, 25th, 26th, Tex.; 27th, Ala., Tex.; 28th, Ala., Ga., La., Miss., Tex.; 29th, Ala., Fla., Ga., La., Miss., S. C., Tex.; 30th, Ala., Fla., Ga., La., Miss., S. C., Tex.; 31st, Ala., Ga., La., Miss., S. C., Tex.

In South Carolina and Georgia no frost was reported along the immediate coast. In Florida frost was not noted until the 29th, except at Pensacola; it was reported generally throughout the northern half of the state on that and the following date. In Alabama frost was reported frequently during the month in the interior of the state. In Mississippi and Louisiana it was observed on fourteen and seventeen dates, respectively, and was of frequent occurrence along the Mississippi River in the southern parts of the states. In Texas frost was reported on twenty-six dates, but was not noted along the immediate coast, save at Corpus Christi, where it was reported on the 21st. Frost was also reported on the 21st at Rio Grande City. When compared with the preceding month the southern limit of frost in Florida for January, 1889, was about 1° farther north, while in Texas it was extended considerably to southward.

LIMITS OF FREEZING WEATHER.

On chart V are shown the southern and western limits of freezing weather during January, 1889. East of the Rocky Mountains the temperature fell below 32°, except in Florida south of the thirtieth parallel, and at stations on the immediate Gulf coast. On the Pacific coast the temperature fell to 32° at Fort Canby, Wash., while to the southward a line representing the western limit of freezing weather is traced over western California, south of the fortieth parallel, to Los Angeles, and thence southeastward to the southwest portion of Arizona.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for January, 1889:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
	°	°	°	°	°
Canby, Fort, Wash.	47.5	42.5	5.0	45.2	43.7
Cedar Keys, Fla	62.0	50.3	11.7	59.0	57.0
Charleston, S. C.	54.9	51.2	3.7	52.9	50.0
Eastport, Me	40.6	37.1	3.5	39.1	27.0
Galveston, Tex	58.3	47.5	10.8	53.8	52.4
Key West, Fla.	76.1	67.1	9.0	71.9	70.3
New York City	38.6	35.2	3.4	36.7	36.2
Pensacola, Fla	58.7	51.0	7.7	56.2	51.4
Portland, Oregon	42.3	37.7	4.6	39.8	38.6

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for January, 1889, as determined from the reports of nearly 1,500 stations, is exhibited on chart III. In the table of miscellaneous meteorological data are given, for each

Signal Service station, the total precipitation, with the departure from the normal. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

On the north Pacific coast, over the northern portions of the plateau districts and eastern Rocky Mountain slope, over an area extending from Louisiana, Mississippi, and northern Alabama to the upper Ohio valley and Lake region, and in portions of New England and the Maritime Provinces, the precipitation for January, 1889, was below the normal. In all other portions of the country, with the exception of a small area in the lower Missouri valley, it was in excess of the normal. The marked deficiency on the Pacific coast and the equally noteworthy excess in Florida and over the greater part of the country from the lower Mississippi valley westward to Arizona, form the most important features of this month's precipitation. Upon the whole there was not more than 40 per cent. of the normal rainfall on the Pacific coast, the deficiency being greatest in northern California, where less than 15 per cent. of the normal amount of rain fell. In southern California and on the north Pacific coast the percentages of normal rainfall were about 42 and 63, respectively. A marked deficiency also occurred in the middle and northern plateau districts, northern slope, and Ohio Valley, where the precipitation ranged from one-half to three-fourths of the monthly normal. There was more than three times the normal precipitation over the middle and southern portions of the eastern slope of the Rocky Mountains; about double the average in the southern plateau, and from 70 to 80 per cent. more than the normal in Florida, the west Gulf states, and Missouri Valley. In the upper lake region, Rio Grande Valley, middle and south Atlantic states there was an excess ranging from 20 to 40 per cent. of the normal. In the extreme northwest, upper Mississippi valley, lower lake region, New England, and the east Gulf states the monthly precipitation closely approached the normal, there being a slight deficiency in New England and the extreme northwest, and a slight excess in the other districts mentioned.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for a series of years; (2) the length of record during which the observations have been taken, and from which the average has been computed; (3) the total precipitation for January, 1889; (4) the departure of the current month from the average; (5) and the extreme monthly precipitation for January during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of Jan.	(2) Length of record.	(3) Total for Jan., 1889.	(4) Departure from average.	(5) Extreme monthly precipitation for January.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches*		*Inches.*	
Lead Hill	Boone	2.41	7	3.78	+1.37	3.78	1889	1.33	1887
California.									
Sacramento	Sacramento	3.87	35	0.19	−3.68	15.04	1862	0.19	1889
Colorado.									
Fort Lyon	Bent	0.16	14	0.53	+0.37	0.68	1886	trace.	1876
Connecticut.									
Middletown	Middlesex	4.24	27	5.64	+1.40	7.18	1859	1.45	1876
Florida.									
Merritt's Island	Brevard	3.46	11	10.21	+6.75	10.45	1878	0.57	1880
Georgia.									
Forsyth	Monroe	5.01	15	8.86	+3.85	10.06	1883	2.22	1880
Illinois.									
Peoria	Peoria	1.70	31	1.70	0.00	4.27	1862	0.20	1872
Riley	McHenry	1.95	38	1.86	−0.09	5.96	1876	0.45	1867, 1865, 1872
Indiana.									
Vevay	Switzerland	4.04	22	2.82	−1.22	9.03	1876	0.75	1872
Iowa.									
Cresco	Howard	1.31	17	1.55	+0.24	3.72	1886	0.38	1872, 1884
Monticello	Jones	1.65	34	1.72	+0.07	3.77	1886	0.29	1865
Logan	Harrison	1.27	20	1.49	+0.22	3.10	1881	0.10	1872

Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of Jan.	(2) Length of record.	(3) Total for Jan., 1889.	(4) Departure from average.	(5) Extreme monthly precipitation for January.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Kansas.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches*		*Inches.*	
Lawrence	Douglas	1.25	24	0.79	−0.46	3.05	1878	0.12	1875
Wellington	Sumner	0.71	10	0.96	+0.25	1.53	1886	0.18	1881
Louisiana.									
Grand Coteau	St. Landry	7.12	6	5.70	−1.42	13.30	1883	2.52	1887
Maine.									
Gardiner	Kennebec	3.72	47	5.20	+1.48	7.32	1887	0.92	1849
Maryland.									
Cumberland	Allegany	2.11	17	3.01	+0.90	3.90	1878	0.30	1887
Massachusetts.									
Amherst	Hampshire	3.34	53	3.50	+0.16	5.87	1870	0.99	1849
Newburyport	Essex	3.69	11	5.89	+2.20	7.76	1886	1.60	1875
Somerset	Bristol	4.33	16	6.20	+1.87	7.60	1878	1.57	1879
Michigan.									
Kalamazoo	Kalamazoo	2.56	13	1.46	−1.10	4.90	1876	1.10	1879
Thornville	Lapeer	1.93	12	2.51	+0.58	2.78	1881	0.58	1879
Minnesota.									
Minneapolis	Hennepin	1.23	23	0.69	−0.54	3.01	1886	0.06	1869
Montana.									
Fort Shaw	Lewis&Clarke	0.63	18	0.38	−0.25	2.50	1881	0.00	1869
New Hampshire.									
Concord	Merrimack	3.23	7	3.81	+0.58	4.92	1886	1.50	1867
New Jersey.									
Moorestown	Burlington	3.81	15	4.07	+0.26	5.82	1882	1.13	1867
South Orange	Essex	3.95	17	7.15	+3.20	7.15	1889	1.17	1876
New York.									
Cooperstown	Otsego	2.44	35	2.22	−0.23	4.31	1869	0.32	1860
Palermo	Oswego	3.14	35	3.48	+0.34	6.50	1874	0.16	1884
North Carolina.									
Lenoir	Caldwell	4.51	17	3.50	−1.01	9.60	1878	1.60	1872
Ohio.									
N. Lewisburgh	Champaign	3.63	17	4.80	+1.17	8.67	1876	0.44	1877
Wauseon	Fulton	2.22	15	2.17	−0.05	3.53	1880	1.29	1879
Oregon.									
Albany	Linn	9.05	12	3.96	−5.09	14.45	1867	2.22	1882
Eola	Polk	6.20	19	3.08	−3.12	16.68	1888	2.53	1875
Pennsylvania.									
Dyberry	Wayne	3.20	19	(†)	(†)	4.75	1878	0.70	1872
Grampian Hills	Clearfield	3.76	18	3.22	−0.54	5.47	1888	1.21	1872
Wellsborough	Tioga	6.73	9	8.20	+1.47	12.17	1886	3.70	1888
South Carolina.									
Statesburgh	Sumter	3.72	7	4.91	+1.19	6.04	1885	2.14	1888
Tennessee.									
Austin	Wilson	5.44	20	4.62	−0.82	18.11	1882	2.66	1886
Milan	Gibson	5.79	5	4.82	−0.97	7.50	1885	4.45	1884
Texas.									
Fort Concho	Tom Green	0.84	14	1.94	+1.10	4.36	1880	0.00	1887
New Ulm	Austin	4.04	15	8.38	+4.34	10.56	1882	1.09	1887
Vermont.									
Strafford	Orange	3.40	15	4.80	+1.40	5.50	1887	1.70	1878
Virginia.									
Bird's Nest	Northampton	3.68	20	5.85	+2.17	6.75	1882	1.00	1876
Wytheville	Wythe	3.53	24	3.05	−0.48	7.10	1882	1.50	1872
West Virginia.									
Helvetia	Randolph	5.05	12	2.95	−2.10	9.50	1882	2.95	1889
Wisconsin.									
Madison	Dane	1.96	23	1.59	−0.37	3.65	1874	0.40	1878
Washington.									
Fort Townsend	Jefferson	2.12	18	1.02	−1.10	3.62	1878	0.66	1859

† Report not received.

HAIL.

Hail fell during January on the several dates as follows: 2d, Conn., La. 3d, Me., Oregon. 5th, Mass. 6th, Me., Mass., N. H., N. Y. 7th, Me. 8th, La. 9th, N. H., N. J., N. Y., Pa.. Wis. 12th, Cal. 13th, Kans., Tex. 14th, Ariz., Kans., Ohio. 15th, Ariz., Idaho., Ind. T., Kans., Tex., Wis. 16th, Ill., Iowa, Wis. 17th, Mich., Oregon, Wash. 18th, Oregon. 20th, Mich., Oregon. 24th, N. Y., Pa. 27th, Conn., Me., Mass., N. H., Tenn. 31st, D. C., Ind.

SLEET.

Sleet fell during January on the several dates as follows: 1st, Oregon, Tex. 2d, Oregon, Vt. 3d, Dak. 4th, Dak., Minn., W. Va. 5th, Dak., Ind., Mich., Minn., Nebr. 6th, Kans., Mass., N. H., N. Y., W. Va. 7th, N. H., N. Y., Ohio. 8th, Dak., Iowa, Mo., Wis. 9th, Conn., Mass., Mich., Tenn., Vt., Wis. 12th, Kans. 13th, Ariz., Kans., Mo. 14th, Ariz., Ind., Kans., Mo., Nebr. 15th, Ariz., Iowa, Kans., Mich., Minn., Nebr., Wis. 16th, Ariz., Iowa, Mich., Minn., Wis. 17th, W. Va. 18th, Miss. 19th, Mo. 20th, Ind., Ky., Md., N. J., N. C., Ohio, Pa. 21st, Cal., Me. 23d, Cal. 24th, Vt., Wash. 25th, Nebr. 26th, Ind. T., La., Md., Tex. 27th, Conn., Me., Mass., N. Y., Tenn. 28th, Me., Mass., Pa. 30th, Minn. 31st, Pa.

SNOW.

On the 28th snow reached its southernmost latitude for the

month and, so far, for the winter also. On the date mentioned it fell generally throughout the east Gulf and south Atlantic states, and was reported from stations on both the east Gulf and south Atlantic coasts. As usual in the winter season, snow was of daily occurrence in some part of the country. In Michigan there were but three days during the month, viz., the 2d, 3d, and 23d, on which it did not occur in some part of the state, and in Dakota, Minnesota, Wisconsin, Iowa, Pennsylvania, New York, and Vermont it fell on from twenty to twenty-six days. On the 9th, 10th, 13th to 15th, 18th to 21st, 27th and 28th, snow fell in more than twenty states or territories, being reported from as many as thirty-one on the 20th. The date on which it was least extensively reported was the 2d, when it occurred only in Montana, New York, Oregon, and Vermont.

MONTHLY SNOWFALLS (inches and tenths) IN JANUARY.

While in some portions of the country, viz., northern New York and the northern portion of the upper lake region, the monthly snowfalls have been heavy, and have probably equalled, or exceeded, the January average, as a whole the snowfalls of January, like those of the two preceding months, have been unusually small. There can be no doubt that the winter snowfall, to the close of January, over much of the country, particularly the central and southern portions, is the smallest that has occurred for a number of years. In the northern portions of the country from Dakota eastward to New England, and over limited areas in the Rocky Mountain and plateau regions, the aggregate snowfall for January generally exceeded ten inches, and in portions of the Lake region and New England depths ranging from twenty to fifty inches were reported, the greatest occurring in northern New York, Low ville, and Number Four, in that state, reporting 56.1 and 59.9, respectively.

Below are given all monthly snowfalls of ten inches, or more, and in states or territories where the maximum depth was below that amount, the station reporting the greatest is given: *Alabama.*—Bermuda, 2. *Arizona.*—Fort Grant, 11; Prescott, 10. *Arkansas.*—Lead Hill, 7.1. *California.*—Fort Bidwell, 11.4; Emigrant Gap, 11; Coles and Dunsmuir, 10. *Colorado.*—Coulter and Leadville, 11. *Connecticut.*—New Hartford, 8.5. *Dakota.*—Huron, 15.1; Grand Forks, 12.2; Kimball, 11; Fort Sully, 10.6; Webster, 10.4. *Delaware.*—Newark, 2.5. *District of Columbia.*—Washington City, 3. *Georgia.*—Duck, 1. *Idaho.*—Boisé City, 7. *Illinois.*—Rockford, 17; Cedarville and Warren, 12; Winnebago, 11.5; Mount Morris and Oneida, 11; Petersburgh, 10.8; Rock Island, 10. *Indiana.*—Columbia City, 9.5. *Indian Territory.*—Fort Gibson, 4.5. *Iowa.*—Iowa City, 13.5; Keokuk, 12.5; Dubuque, 11.5; Maquoketa, 11. *Kansas.*—Seneca, 7.5. *Kentucky.*—Madisonville, 3. *Louisiana.*—Arcadia, Farmerville, Lake Providence, Liberty Hill, Point Pleasant, Saint Joseph, and Trinity, trace. *Maine.*—Calais and Lewiston, 17; Belfast, 16; Orono, 15.5; Cornish and Kent's Hill, 15; Gardiner, 14.5; Fairfield, 10. *Maryland.*—Cumberland, 11. *Massachusetts.*—Rowe, 16; Deerfield, 13.5; Groton, 13; Fitchburgh *b*, Gilbertville, Lawrence and Leominster, 12; Amherst, Fitchburgh *a*, Newburyport, and Waltham, 10. *Michigan.*—Marquette, 39.2; Calumet, 38.3; Atlantic, 38; West Branch, 25; Harrisville, 22.8; Hillman, 22; Alpena, 21.2; Traverse City *b*, 19.9; Roscommon, 19.8; Fletcher, 19.5; Lathrop, 19; Buchanan and Gulliver Lake, 18.8; Benzonia, 18; Traverse City *a*, 17.5; Mio, 17.4; Deer Lake and Port Huron, 17; Manistee, 16.4; Alma, 15.5; Omer and Thornville, 14; Ionia, 13.5; Cassopolis and Washington, 13; May, 12.5; Paw Paw, 12.2; Bear Lake, Benton Harbor, East Tawas, and Vandalia, 12; Fremont, 11.7; East Saginaw, 10.9; Fort Brady, 10.6; Hudson, Lansing, and Mottville, 10.5; Ypsilanti, 10.4. *Minnesota.*—Lake Winnibigoshish, 14.8; Pokegama Falls, 12.4; Moorhead, 12.3; Leech Lake, 11.1. *Mississippi.*—Palo Alto and Pontotoc, 0.2. *Missouri.*—Miami, 12; Mound City, 10.8; Wither's Mill, 10.7. *Montana.*—Sheldon, 13.7; Fort Maginnis, 10.6. *Nebraska.*—Burner's Ranch, 45; Tuscarora, 19; Pioche, 12.2; Eureka, 12.1; Austin, 12; Wellington, 10.8. *New Hampshire.*—Berlin Falls and Berlin Mills, 25; North Conway, 24; West Milan, 18; North Chesterfield, 17; Antrim, 16; Hanover, 14; Concord and Plymouth, 13; Manchester, 10.5; Nashua, Shaker Village, and Walpole, 10. *New Jersey.*—South Orange, 6. *New Mexico.*—Fort Wingate, 13; Fort Union, 12; Las Vegas, 11.9. *New York.*—Number Four, 59.9; Lowville, 56.1; Saranac Lake, 43.8; Potsdam, 38; Barnes' Corners, 36; Canton and North Hammond, 34.4; Constableville and Utica, 32; Oswego, 25.2; Buffalo, 24.9; Nineveh, 24; Fort Porter, 23; Penn Yan, 22.5; Auburn, 21.9; Queensborough, 20.6; Ilion, 20; Angelica, Palermo, and Plattsburgh Barracks, 19.5; Perry City, 19; Hess Road Station, 17.9; Rochester, 17.8; Wedgewood, 15.7; Ithaca, 14.1; Eden, 14; Geneva, 13.8; Le Roy, 13; Albany, 12.2; Cooperstown, Friendship, and Humphrey, 12; Factoryville, 10.4; Elmira, 10. *North Carolina.*—Lenoir and Hot Springs, 2. *Ohio.*—North Lewisburgh, 12.8; Caledonia, 12; Cleveland, 11.7; Kenton, 11.5; Bellevue, and Wauseon, 10.8; Tiffin, 10.7. *Oregon.*—Fort Klamath, 16.1; Siskiyou, 14. *Pennsylvania.*—Meadville *b*, 21; Eagle's Mere, 19.2; Coudersport, 17.5; Grampian Hills, 17; Meadville *a*, 14.8; Somerset, 12.8; Wellsborough, 12.4; Rimersburgh, 12.2; Le Roy, 10.9; New Castle, 10.5; Tionesta, 10. *Rhode Island.*—Woonsocket, 7. *South Carolina.*—Brewer's Mines, Cedar Springs, and Trial, trace. *Tennessee.*—Clarksville, 3. *Texas.*—Decatur, 8. *Utah.*—Salt Lake City, 6.8. *Vermont.*—Burlington, 33; Coventry, 32.6. Northfield, 30.2; Chelsea, 25; East Berkshire, 23; Strafford, 22; Conway, 21; Middlebury, 19.4; Jacksonville and Saint Johnsbury, 19; Lunenburgh, 16; Saxton's River, 15; Vernon, 14; Manchester, 13. *Washington.*—Fort Spokane, 20.5; Spokane Falls, 15. *West Virginia.*—Middlebrook, 23; Helvetia, 13.5. *Wisconsin.*—Green Bay, 32.6; Oshkosh, 20.5; Fond du Lac, 17; Cadiz, 12; Waucousta, 11.5; Phillips, 10. *Wyoming.*—Carter, 22; Fort Bridger and Fort Washakie *a*, 11.5; Fort Washakie *b*, 10.

DEPTH OF SNOW REMAINING ON GROUND AT 15th AND CLOSE OF MONTH.

On chart v are shown the portions of the country covered by snow at the close of January (also the southern and western limits of freezing weather) and in the table of data for voluntary stations are given the depths as reported by the various observers. In the Red River Valley of the North, northern portion of the upper lake region, and over the greater portion of New York and the New England states there remained at the end of January upwards of six inches of snow, and over limited areas in the districts named the depth was much greater. In the upper Michigan peninsula and in the northern portions of New York and Vermont depths ranging from twenty to thirty inches were reported from numerous stations. South of the 40th parallel eastward of the Rocky Mountains there was very little snow on the ground at the close of the month, and over much of the country northward of that parallel the depth did not exceed two inches. In the central and northern portions of the Rocky Mountain and plateau regions the depths generally range from two to eight inches. The following are some of the greatest depths reported: Barnes' Corners, N. Y., 36; Number Four, N. Y., 29.8; Canton and Constableville, N.Y., 26; Calumet, Mich., and North Volney, N.Y., 24.

As was the case at the middle of the two preceding months, there was not sufficient snow on the ground on the 15th of January to justify the issue of a chart. While a number of reports show depths of four inches and upwards at that date, it appears that these depths covered areas of very limited extent in northern New York, portions of Michigan, Wisconsin, Minnesota, Nebraska, Colorado, and western Kansas. The following are the greatest depths reported on the 15th of the month: Number Four, N. Y., 15; Barnes' Corners, N. Y., 13; Ouray, Colo., 12; Independence, Iowa, 10.

EXCESSIVE PRECIPITATION, JANUARY, 1889.

It will be seen from the accompanying table of excessive

Valentine, 12.5; North Platte, 10.8; Fairbury, 10. *Nevada.*—precipitation that monthly rainfalls exceeding ten inches occurred only in Florida, Georgia, Oregon, and Texas; the largest amount being 13.85, at Tyler, Tex.

Daily falls of 2.50, or more, were reported from Alabama, Arkansas, Florida, Georgia, Massachusetts, Mississippi, New Jersey, Pennsylvania, Tennessee, Virginia, and Washington, and occurred mostly on the 15th and 16th. The most remarkable daily fall was 4.00 on the 26th at Saint Martinsville, La.

The rate of one inch per hour was attained in but one instance, viz., Titusville, Fla., where 1.03 fell in 23 minutes on the 4th, giving a rate of 2.21 per hour.

State and station.	Monthly rainfall 10 inches or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
	Amt.	Amt.	Day.	Amt.	Time.	Day.
Alabama.	*Inches.*	*Inches.*		*Inches.*	*h. m.*	
Bermuda		3.02	16			
Mount Vernon Barracks		3.71	16			
Arkansas.						
Camden		2.84	16			
Helena		2.72	16			
Hot Springs		2.60	8			
Little Rock		3.54	15-16			
Little Rock Barracks		3.88	15-16			
Florida.						
Altamonte Springs	11.15					
Jupiter		6.38	11-12			
Merritt's Island	10.21	2.81	23			
Micco	10.22	3.93	23			
Titusville	10.52			1.03	0 28	4
Georgia.						
Hephzibah	10.24	6.03	19-20			
Quitman	10.40	3.25	16			
Indiana.						
Huntingburgh		3.50	16			
Louisiana.						
Saint Martinville		4.00	26			
Massachusetts.						
Blue Hill		3.10	6			
Mississippi.						
Kosciusko		2.75	16			
New Jersey.						
Freehold		3.56	5-6			
Hanover		2.50	6			
Plainfield		3.48	5-6			
Tom's River		2.96	6			
Oregon.						
Astoria	10.67					
Pennsylvania.						
Wellsborough		3.00	5-6			
Tennessee.						
Trenton		2.58	16			
Texas.						
Austin		2.85	14			
Brazoria	10.04					
Corsicana		2.60	15			
Longview		2.90	15			
Mexia		3.90	23-24			
Tyler	13.85					
Waco		2.50	23			
Virginia.						
Cape Henry		2.65	27			
Washington Territory.						
Fort Canby		2.89	23-24			

SUMMARY OF EXCESSIVE PRECIPITATION.

The following table gives the aggregate number of excessive monthly, daily, and hourly rainfalls for the several states and territories, shown by the monthly and supplementary tables of excessive precipitation, published in the MONTHLY WEATHER REVIEW during 1888:

States.	Rainfalls of 10 inches, or more, per month.	Rainfalls of 2.50 inches, or more, in 24 hours.	Rainfalls equalling, or exceeding, one inch per hour.	Number of stations.	Average length of record.	Average interval of excessive monthly rainfall for each station.
					Years	*Years.*
Alabama	218	242	28	31	8	1
Arizona	6	14	12	5	6	5
Arkansas	69	134	35	18	6	2
California	482	27	9	86	12	2
Colorado	7	16	8	5	8	6
Connecticut	53	102	6	18	14	5
Dakota	16	86	34	12	9	7
Delaware	11	27	1	4	8	3
District of Columbia	12	16	7	1	50	4

Summary of excessive precipitation—Continued.

States.	Rainfalls of 10 inches, or more, per month.	Rainfalls of 2.50 inches, or more, in 24 hours.	Rainfalls equalling, or exceeding, one inch per hour.	Number of stations.	Average length of record.	Average interval of excessive monthly rainfall for each station.
					Years	*Years.*
Florida	344	338	106	43	8	1
Georgia	299	388	72	64	6	1
Idaho	0	0	0			
Illinois	82	265	64	42	9	4
Indiana	94	139	40	46	7	3
Indian T	17	48	10	6	16	6
Iowa	183	290	126	89	8	4
Kansas	92	279	129	38	10	4
Kentucky	21	60	8	7	14	5
Louisiana	179	272	25	41	5	1
Maine	36	43	5	16	15	7
Maryland	46	226	24	17	12	4
Massachusetts	130	264	19	47	14	5
Michigan	33	93	31	19	14	8
Minnesota	28	64	18	15	14	8
Mississippi	153	210	27	36	6	1
Missouri	98	169	50	43	9	4
Montana	2	13	8	1	15	15
Nebraska	56	133	103	28	6	3
New Hampshire	62	48	10	12	9	2
New Jersey	85	179	8	34	9	4
New Mexico	5	4	7	5	12	12
New York	179	160	31	59	18	6
Nevada	0	0	0			
North Carolina	224	394	75	45	6	1
Ohio	92	153	3	41	14	6
Oregon	226	46	0	21	8	2
Pennsylvania	80	132	79	34	11	5
Rhode Island	13	38	3	8	15	10
South Carolina	132	212	39	35	7	2
Tennessee	112	258	60	49	6	3
Texas	201	356	168	64	8	3
Utah*	0	6	0			
Vermont	8	16	3	9	13	15
Virginia	79	117	36	20	9	3
Washington	166	46	0	14	10	1
West Virginia	5	12	4	3	6	4
Wisconsin	27	58	11	13	11	6
Wyoming	0	2	6			

*The monthly rainfall of 10 inches in March, 1877, for Mount Carmel, Utah, published in tables, is considered doubtful and is not noted herein.

In referring to the above table for information relative to the comparative frequency of excessive rainfall in the different sections, the number of stations which represent the several states and territories, and their distribution and length of record, should be considered. As indicated by the heading, the table presents a summary of excessive rainfalls published in the MONTHLY WEATHER REVIEW during 1888. While these publications contained all available data, the summarized results cannot be unreservedly used in determining the comparative frequency of excessive rainfall, more particularly for short intervals, as the system and extent of rainfall observation vary in the different states and territories: resulting in complete and exhaustive reports from some sections and comparatively meagre data from others. It is considered, however, that the summary of excessive monthly rainfall, when considered with the number of stations and average length of record for each state and territory, presents a fairly accurate record for a greater portion of the country. In the column "Average interval of excessive monthly rainfall for each station," it is intended to show the probable frequency, in years, of excessive monthly precipitation at each station in the several states, *i. e.*, at Alabama stations monthly rainfalls of ten inches occur once in one year; at Arizona stations once in five years. In this connection it will also be necessary to consider the distribution of stations, more particularly as regards their proximity to one another, as, in cases where a number of stations are located in the same portion of the state, the probable interval of excessive monthly rainfall would be smaller. This fact is the more apparent in cases where stations are numerous, and bunched in river valleys, as in California; in such instances figures showing general results must be considered with a due allowance for the distribution and number of stations. This column also indicates, with a fair degree of accuracy, the comparative frequency of excessive monthly rainfall by states and territories, and any lack of uniformity, or apparent incon-

sistency in the results therein shown, may be attributed to a more perfect system of observation in vogue in some of the states. Thus, in New Hampshire the average interval of excessive monthly precipitation is given as two years, while in the adjoining state of Vermont the interval is fifteen years. This discrepancy is doubtless due to the more complete reports from New Hampshire, the observations taken at several points by the Lake Winipiseogee Cotton and Woolen Manufacturing Co. constituting an exceptionally accurate and valuable record extending over many years. Aside from this most marked exception it will be seen that, as a rule, there is a remarkable uniformity shown in the average interval of monthly excessive rainfalls in contiguous states and territories, the interval being smallest in Oregon, where it is only eight months, and only slightly greater in the Gulf States, North Carolina, and Washington, where it averages about one year. Exclusive of Vermont, the greatest average interval of excessive monthly rainfall, fifteen years, is shown for Montana, while in Dakota, Michigan, and Minnesota it is seven and eight years, respectively.

In the column of rainfalls of ten inches, or more, per month, it will be seen that by far the greatest number of excessive monthly rainfalls (482) have been reported in California, where stations are numerous, and that none have been noted in Idaho, Nevada, Utah, and Wyoming, where, while stations are comparatively few and scattered, it is not probable that rain has fallen in amounts to equal or exceed ten inches in a month. Following in order of greater frequency are, Florida with 344, and Georgia, North Carolina, Oregon, and Texas, with more than 200, while in Arizona, Colorado, Montana, New Mexico, Vermont, and West Virginia, the instances of their reported occurrence are very limited in number.

The greatest number of daily excessive rainfalls, 556, have been reported in Texas, while in Idaho and Nevada none have been noted. In North Carolina, Georgia, and Florida over 300 instances have been reported in which 2.50 inches, or more, of rain have fallen in twenty-four hours, while in Alabama, Illinois, Iowa, Kansas, Louisiana, Maryland, Massachusetts, Mississippi, and Tennessee excessive daily rainfalls have been noted in more than 200 instances. In Arizona, Colorado, Montana, New Mexico, Utah, Vermont, West Virginia, and Wyoming the number of excessive daily rainfalls recorded is less than 20.

Excessive hourly rainfalls have been reported in the greatest number of instances, 168, in Texas, and none have been noted in Idaho, Nevada, Oregon, Utah, and Washington. They have been reported in more than 100 instances in Florida, Iowa, Kansas, and Nebraska, while in Arizona, California, Colorado, Connecticut, District of Columbia, Indian Territory, Kentucky, Maine, Massachusetts, Minnesota, Montana, New Jersey, New Hampshire, New Mexico, Ohio, Rhode Island, Vermont, West Virginia, Wisconsin, and Wyoming, excessive hourly rainfalls have been noted in less than 20 instances.

Over portions of the Rocky Mountain region where monthly rainfalls equalling or exceeding ten inches have not been reported, the largest monthly rainfalls noted in the several states and territories have been published in the tables of excessive precipitation in the REVIEW during 1888.

WINDS.

The prevailing winds during January, 1889, are shown on chart ii by arrows flying with the wind. In the Atlantic coast states north of the thirty-seventh parallel; over a greater portion of the Lake region; in the upper Mississippi, Missouri, and Ohio valleys, and along the south Pacific slope, the winds were mostly westerly. In the south Atlantic and Gulf states, and over the eastern slope and plateau regions of the Rocky Mountains, they were variable. On the north Pacific slope they were from south to east, while along the middle Pacific slope northerly winds were most frequently noted.

HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour, other than those given in the table of miscellaneous meteorological data, have been reported as follows: Wood's Holl, Mass., 57, s, 9th; 50, nw., 19th; 54, se., 21st. Buffalo, N. Y., 52, sw., 16th and 17th; 52, w., 21st. Block Island, R. I., 54, e., 5th; 54, nw., 10th; 60, se., 21st; 52, e., 27th. Fort Elliott, Tex., 52, nw., 8th. Fort Canby, Wash., 50, se., 3d. Valentine, Nebr., 52, nw., 8th; 54, n., 30th.

LOCAL STORMS.

Descriptions of severe local storms which attended the passage of low area iii are given under the heading "Areas of low pressure," and the following reports refer to disturbances occasioned by the passage of depressions traced on chart i.

5th. *Virginia.*—Lynchburgh: a severe wind and rain storm occurred during the early morning. It came from the east and did some damage in this city and vicinity. Maximum velocity of wind, thirty-six miles per hour from the east, at about 6 a. m. Rain continued during the day, 1.26 of an inch being measured at the morning and 0.52 at the evening observation.

6-7th. *New York.*—New York City: the high northeasterly shifting to westerly winds were very destructive in Brooklyn; six houses in course of erection, and numerous trees and fences in that city were blown down. Watertown: reports show that the sleet storm which prevailed during these dates destroyed thousands of valuable shade, fruit, and forest trees in Jefferson and Saint Lawrence counties. The telegraph and telephone wires were heavily coated with ice and broke under its weight, seriously interrupting communication.

20-21st. *Massachusetts.*—Boston: heavy snow and high wind prevailed during the night. The wind blew a gale of forty to fifty miles per hour for five hours, and attained a maximum velocity of fifty-four miles per hour at 2 a. m., 21st. The storm was very severe in this vicinity; several lives were lost and considerable damage was caused to shipping.

21st. *North Carolina.*—Hatteras: storm began from the southwest 2.55 a. m. and ended 3.10 a. m.; maximum velocity of the wind thirty-five miles per hour. The life-saving station at Cape Hatteras reports five men drowned, one barkentine and one three masted schooner sunk, and other vessels disabled on Hatteras shoal during the gale.

WATER-SPOUTS.

"The San Pedro (Cal.) Advocate," of January 19, 1889, states that two water-spouts were observed off San Pedro 15th; one on the east side of the bay near Anaheim Landing, and the other in the vicinity of Catalina Island. They were funnel shaped, the larger end in the cloud, and the smaller end in the water. They moved rapidly and broke before reaching the coast.

INLAND NAVIGATION.

ICE IN RIVERS AND HARBORS.

Albany, N. Y., 23d: the Hudson River froze over for the first time this season this morning.

Buffalo, N. Y.: the lake, open to the 28th, was covered with ice on that date as far as could be seen from this place.

Cleveland, Ohio: a transfer ferry-boat for use at Detroit,

Mich., left here during the night of the 13–14th. A mid-winter trip of that kind is unprecedented in lake navigation.

Pittsburgh, Pa.: floating ice in both rivers 21st to 24th, and floating ice in the Allegheny River, 28th to 31st.

Alpena, Mich.: Thunder Bay and Thunder Bay River, which had been free from ice since the commencement of the month, were partly frozen over on the 12th.

Keokuk, Iowa: The Mississippi River was full of floating ice on the 17th.

Leavenworth, Kans: floating ice in the Missouri River, 1st to 6th, 10th, 11th, 14th, 17th, 18th, 20th, 21st, 27th to 29th.

FLOODS.

Little Rock, Ark.: owing to heavy rains the Arkansas River rose very high on the 19th, overflowing a great extent of country below this city.

Shreveport, La.: rain, which fell at intervals after the 22d, and without interruption during the 25th and 26th, ended in sleet at 11.15 p. m., 26th. The Red River rose above the danger-line on the 26th and 27th, overflowing lowlands, driving some of the settlers out of their homes, and causing them to remove stock to the highlands.

HIGH TIDES.

Pysht, Wash., 7th.

Atlantic City, N. J.: owing to high northeasterly winds on the 5th and 6th, the tide rose very high on the latter date; much damage to property resulted.

New York City, N. Y.: the high tide at Coney Island on the 7th caused considerable damage to property.

Ocean City, N. J.: the severe northeast storm of the 5th and 6th caused the tide to rise very high on the 6th; washouts of about seven hundred feet occurred on the Ocean City branch of the West Jersey railroad, between this place and Sea Isle City; on the Sea Isle City Pleasure railroad, three hundred feet of Townsend's Inlet bridge were carried away.

Long Branch, N. J., 6th: most of the bulk-heads between Sea Bright and Monmouth Beach have been torn; the surf has inundated the streets of Sea Bright and caused much damage to property.

STAGE OF WATER IN RIVERS AND HARBORS.

In the following table are shown the danger-points at the various stations; the highest and lowest depths for January, 1889, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, January, 1889 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La.	29.9	31	31.6	1	13.9	17.7
Arkansas River:						
Fort Smith, Ark.	22.0	17	17.9	7, 8	5.8	12.1
Little Rock, Ark.	23.0	19	21.2	8	8.7	12.5
Missouri River:						
Leavenw'rth, Kans.	20.0	1	4.7	18	3.2	1.5
Kansas City, Mo.	21.0	31	5.4	8	3.4	2.0
Mississippi River:						
Saint Paul, Minn.*	14.5	.....	.....	.....	.....	.....
La Crosse, Wis.*	24.0	.....	.....	.....	.....	.....
Dubuque, Iowa.*	16.0	.....	.....	.....	.....	.....
Davenport, Iowa	15.0	9	2.0	1, 2	0.6	1.4
Keokuk, Iowa	14.0	18	3.0	1	— 0.7	3.7
Saint Louis, Mo.	32.0	20, 21	11.8	8	4.0	7.8
Cairo, Ill.	40.0	22	31.0	6	14.8	16.2
Memphis, Tenn.	34.0	24	24.8	7, 8	11.6	13.2
Vicksburg, Miss.	41.0	28, 29	33.8	1	13.1	20.7
New Orleans, La.	13.0	27	8.7	1, 15	6.3	2.4
Ohio River:						
Pittsburgh, Pa.	22.0	29	13.2	22	4.4	8.8
Parkersburg, W. Va.	38.0	30	20.2	25	7.9	12.3
Cincinnati, Ohio	50.0	31	34.0	1	20.5	13.5
Louisville, Ky.	25.0	31	12.3	1	8.0	4.3
Cumberland River:						
Nashville, Tenn.	40.0	31	24.5	1	6.0	18.5
Tennessee River:						
Knoxville, Tenn.	29.0	7	7.0	4	2.3	4.7
Chattanooga, Tenn.	33.0	31	14.0	1	5.5	8.5
Monongahela River:						
Pittsburgh, Pa.	29.0	29	13.2	22	4.4	8.8
Savannah River:						
Augusta, Ga.	32.0	28	25.1	4	10.3	14.8
Willamette River:						
Portland, Oregon	15.0	24, 25	4.2	8, 15, 16	2.2	2.0

*Frozen.

ATMOSPHERIC ELECTRICITY.

AURORAS.

The only auroras reported were noted at Wedgwood, N. Y., 7th, and Saint Vincent, Minn., and Leech Farm, Dak., 1st and 20th. At Saint Vincent an auroral arch, first observed 7.45 p. m., 1st, ended during the night. The arch attained altitude 10° and covered 90° of the horizon. The display reached its maximum brilliancy at midnight.

THUNDER-STORMS.

Thunder-storms were reported during the month, by states and territories, as follows: 2d, 1; 4th, 2; 7th and 8th, 1; 9th, 4; 12th, 1; 13th, 4; 15th, 5; 16th, 13; 17th, 1; 19th, 1; 20th, 6; 21st, 4; 23d and 24th, 1; 27th and 30th, 1; 31st, 4. None were reported on the 1st, 3d, 5th, 6th, 10th, 11th, 14th, 18th, 22d, 25th, 26th, 28th, and 29th. Thunder-storms were reported in the several states and territories, by days, as follows: Ala., 3; Ariz., 2; Ark., 2; Fla., 7; Ga., 3; Ill. and Ind., 1; Ind. Ter. and Iowa, 2; Kans, 1; La., 5; Md., Mass., Mich., Miss., Mo., and N. J., 1; N. Y., 2; Oregon, 3; Tenn., 1; Tex., 10; Wash., W. Va., and Wis., 1. In Cal., Colo., Conn., Dak., Del., D. C., Idaho, Ky., Me., Minn., Mont., Nebr., Nev., N. H., N. Mex., N. C., Ohio, Pa., R. I., S. C., Utah, Vt., Va., Wis., and Wyo. no thunder-storms were reported.

Thunder-storms were reported in the greatest number of states and territories (13) on the 16th. On the 20th they were noted in 6, and on the 15th in 5.

They were reported on the greatest number of days (10) in Texas. In Florida they were noted on seven, and in Louisiana on five days.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Villa City, Fla.: forest fires to the east and southeast, 30th.

Fort Sill, Ind. T.: prairie fires, 2d to 6th, 9th, 11th, 18th, 19th.

HALOS.

Solar halos were most frequently reported in Illinois, where they occurred on nineteen days. In Dakota they were noted on eighteen days, in California and New York on twelve, and in Minnesota on eleven days. In Ala., Conn., Del., Ind. Ter., N. Mex., R. I., Utah, W. Va., Wyo., no solar halos were reported. They were reported in the greatest number of states and territories (18) on the 22d; in seventeen on the 4th; in fifteen on the 11th and 12th; and in thirteen on the 19th. There were no days during the month on which solar halos were not observed in one or more states or territories. The following is an extract from the report of the Iowa Weather Service for January, 1889: "The solar halo of the 11th formed a magnificent phenomenon in Montgomery and Adams counties. A vertical column of light preceded the rising sun on the 30th in southern Iowa county; a rather rare form of solar halo."

Lunar halos were most frequently reported in Kentucky and Tennessee, where they were noted on fourteen dates. In New

York they were observed on nine, and in California, Illinois, New Jersey, and Virginia on ten dates. In Colo., Del., Ind. Ter., N. Mex., R. I., and W. Va. no lunar halos were reported. They were observed in the greatest number of states and territories (23) on the 11th; on the 9th in twenty-one, and on the 12th, 15th, and 19th, in seventeen. No lunar halos were reported on the 2d and 30th.

METEORS.

The distribution of meteors, by dates, was as follows: 1st, Somerset, Mass.; Columbia and Montague, Mich.; Rolling Green, Minn. 2d, Fort Sully, Dak.; Villa City and Mantansas, Fla.; Lexington, Ky.; Farmington, Minn.; Nunnelly, Tenn. 4th, Mesquite, Tex. 5th, Albany, Oregon. 7th, Egg Harbor City, N. J. 9th, Lead Hill, Ark.; Farmington, Minn.; Memphis, Tenn. 10th, Keeler, Cal.; Wauseon, Ohio; Nunnelly, Tenn. 11th, Sumner, Ill.; Lebo, Kans. 12th, Vevay, Ind.; Manhattan, Kans.; Nashua, N. H.; Rio Grande, N. J. 14th, Nunnelly, Tenn. 15th, Statesburgh, S. C. 21st, Lebo, Kans. 22d, Lebo, Kans.; Riddleton, Tenn. 24th, Willow Springs, Ariz.; Montrose, Colo.; New England City, Dak. 25th, Lake Forest, Ill.; Beverly, N. J.; Ilion, Setauket, South Canisteo, and Queensborough, N. Y.; Chambersburgh and Wellsborough, Pa. 26th, Fort Sully, Dak.; Villa City, Fla.; Wakefield, Kans. 28th, Fort Sully, Dak.; Corpus Christi, Tex. 29th, Parkston, Dak.; Lebo, Kans.; Mesquite, Tex. 30th, Flint, Mich. 31st, Lebo, Kans.

The following are more notable meteoric displays, noted chiefly on the 24th and 25th:

Rio Grande, N. J., 12th: a large meteor observed in the western sky, traveling very slowly towards the southeast. At times it shone very brilliantly, after which it would become very dim; it disappeared at 9.45 p. m. At 9.25 p. m., just before the meteor was seen, three distinct vibrations of my house were felt, each lasting about 30 seconds.—*Reported by Mr. William Bolton.*

Willow Springs, Ariz.: a brilliant meteor was observed, moving from northeast to southwest, at 8 p. m., 24th: several smaller ones were observed the same evening.

Montrose, Colo.: a brilliant meteor was reported to have passed across the sky from west to northeast at about 9 p. m., 24th; it was followed by a luminous trail.

Beverly, N. J.: a brilliant meteor passed slowly over this place in an easterly direction on the evening of the 25th; it burst into many fragments, like a rocket.

South Canisteo, N. Y.: a meteor was observed at 9 p. m., 25th, moving from south to northeast; it was followed by an unusually brilliant trail of light, of red and greenish colors.

Setauket, N. Y.: a very bright meteor, attended by a long trail of light, was observed at 9.10 p. m., 25th: it first appeared about 30° above the western horizon, moving northeastward. The meteor lighted up the surrounding country and finally exploded into four parts and disappeared.

Wellsborough, Pa.: a large and brilliant meteor was observed the evening of the 25th, passing from west to east; it moved slowly and appeared to burst into many pieces before reaching the eastern horizon. It flashed many brilliant colors.

Fort Sully, Dak.: a brilliant meteor was observed in azimuth 315°, altitude 45°, at 7.25 a. m., 28th; its course was almost horizontal, and it disappeared in azimuth 290°. The meteor left a distinct trail of light which lasted a few seconds.

MIRAGE.

Poplar River, Mont.: a mirage was noticed in early forenoon of the 2d; distant ranges of hills in the north, which are ordinarily hidden from view, became distinctly visible, and appeared like islands in the midst of a body of water.

Mirage were also observed as follows: Garden City and Webster, Dak., 2d, 22d; Woonsocket, Dak., 20th, 21st, 24th, 25th, 28th; Parkston, Dak., 21st, 24th; Hampton, Iowa, and Genoa, Nebr., 7th; La Harpe, Kans., 17th.

SUN SPOTS.

Prof. F. P. Leavenworth, director, Haverford College Observatory, Pa. (observed by Mr. H. V. Gummere, assistant):

Date. January, 1889.	Number of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1, 2 p. m ...	0	0	0	0	0	0	0	0	10	14	Definition good.
3, 11 a. m ...	0	0	0	0	0	0	0	0	10	35	Definition good.
4, 12 m	0	0	0	0	0	0	0	0	13	53	Definition good.
7, 10 a. m ...	0	0	0	0	0	0	0	0	1	2	Definition very poor, clouds.
8, 11 a. m ...	0	0	0	0	0	0	0	0	1	1	Definition poor.
10, 11 a. m ...	0	0	0	0	0	0	0	0	4	6	Definition fair.
12, 11 a. m ...	0	0	0	0	0	0	0	0	3	4	Definition poor.
14, 12 m	0	0	0	0	0	0	0	0	0	0	Definition fair.
15, 12 m	0	0	0	0	0	0	0	0	1	12	Definition poor.
16, 10 a. m ...	1	8	0	0	0	0	1	8	2	22	Definition very good.
18, 10 a. m ...	0	0	0	0	0	0	0	0	12	19	Definition very good.
19, 11 a. m ...	0	0	0	0	0	0	0	0	0	0	Definition very poor.
21, 11 a. m ...	0	0	0	0	0	0	0	0	4	5	Definition good; count of faculæ stopped by clouds.
22, 11 a. m ...	0	0	0	0	0	0	0	0	14	46	Definition very good.
23, 12 m	0	0	0	0	0	0	0	0	10	39	Definition very good.
25, 11 a. m ...	0	0	0	0	0	0	0	0	0	0	Definition poor.
29, 10 a. m ...	0	0	0	0	0	0	0	0	0	0	Definition poor.
30, 11 a. m ...	0	0	0	0	0	0	0	0	6	10	Definition good.
31, 11 a. m ...	0	0	0	0	0	0	0	0	12	23	Definition good.

SAND STORMS.

Dodge City, Kans., 11th.

EARTHQUAKE.

Captain Walle, of the Norwegian bark "Beta," reports: "December 12, 1888, in N. 31° 44′, W. 62° 16′, at 2 a. m., wind ssw. to sw., blowing a gale; heavy rain and lightning; barometer, 29.90; air temperature, 73°; felt a heavy earthquake shock, lasting two minutes. The sensation was that of a ship striking the ground in smooth water and jumping her way over it. At the same time a shower of ashes fell, which appeared to be black or dark grey; was unable to obtain a sample as they were washed away by the heavy rain. After the shock the barometer rose to 30.00."

SNOW FROM A CLOUDLESS SKY.

Dysart, Iowa: snow began at 5.20 a. m., 31st, and continued twenty-five minutes; it fell in sufficient quantity to cover the ground. The stars were seen to the horizon, and no cloud was visible at the time.

VERIFICATIONS.

INDICATIONS FOR 24 HOURS IN ADVANCE.

The percentages of verifications of the 8 p. m. daily indications for January, 1889, as determined from comparison of succeeding telegraphic reports, are given in the table below.

The predictions for districts east of the Rocky Mountains for January, 1889, were made by Capt. Robert Craig, Assistant Quartermaster, U. S. Army, Acting Signal Officer and Assistant, and those for the Pacific Coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps; the verifications for all districts were determined by Assistant Professor C. F. Marvin.

Percentages of indications verified, January, 1889.

States.		States.	
Maine	84.4	Tennessee	80.6
New Hampshire	87.0	Kentucky	81.9
Vermont	83.8	Ohio	81.7
Massachusetts	83.4	West Virginia	85.6
Rhode Island	84.9	Indiana	83.2
Connecticut	85.6	Illinois	85.5
Eastern New York	84.3	Lower Michigan	81.9
Western New York	80.3	Upper Michigan	83.4
Eastern Pennsylvania	90.3	Wisconsin	81.5
Western Pennsylvania	84.3	Minnesota	82.7
New Jersey	88.2	Iowa	81.9
Delaware	88.6	Kansas	87.2
Maryland	90.2	Nebraska	83.5
District of Columbia	90.6	Missouri	88.1
Virginia	91.4	Colorado	82.1
North Carolina	87.8	Dakota	78.5
South Carolina	86.0	Southern California *	95.2
Georgia	83.7	Northern California *	83.9
Eastern Florida	84.8	Oregon *	83.6
Western Florida	83.5	Washington Territory *	81.1
Alabama	84.1	*By elements:* Weather	87.0
Mississippi	81.8	Temperature	81.6
Louisiana	86.5	Monthly percentage of weather and temperature combined †	84.8
Texas	84.9		
Arkansas	88.3		

* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

CAUTIONARY SIGNALS FOR JANUARY, 1889.

Statement showing percentages of justifications of wind signals and cold-wave signals for the month of January, 1889:

***Wind signals.*—(Ordered by Captain Robert Craig.)** Total number of signals ordered, ninety-five; justified as to velocity, wholly, sixty-six, partly, five; justified as to direction, eighty-nine. Of the signals ordered, forty were cautionary, of which twenty-one were wholly, and three partly justified; fifty-five were storm, of which forty-five were wholly, and two partly justified. Thirty-nine were ordered for easterly winds, of which thirty-six were justified, and fifty-six were ordered for westerly winds, of which fifty-three were justified. Ten signals were ordered late. Number of winds without signals, eighteen. Percentage of justifications, 71.6.

***Cold-wave signals.*—(Ordered by Assistant Prof. T. Russell.)** Total number of signals ordered, three hundred and ninety-three; number wholly justified, two hundred and fifteen, of which eight were ordered late. Number partly justified, thirteen. Number of severe cold waves without signals, twenty-four. Percentage of justifications, 55.0.

Percentages of local verifications of weather and temperature signals as reported by directors of the various State Weather Services for January, 1889.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois	86.0	81.0	Nebraska	91.0	85.0
Indiana	87.3	83.3	New Jersey	88.0	84.6
Kansas	91.3	82.5	New York	85.0	79.0
Kentucky	84.0	83.0	North Carolina	85.0	79.0
Louisiana (northern)	88.0	92.0	Ohio	90.0	86.0
Louisiana (southern)	80.0	80.0	South Carolina	72.2	81.0
Michigan	83.1	81.5	Tennessee	83.6	77.1
Minnesota and eastern Dakota	83.0	77.0	Texas	88.0	87.0

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts are republished from reports for January, 1889, of the directors of the various state weather services:

ALABAMA.

The month was uniformly cooler than the average January, but there were few decidedly cold days. The temperature was 3.1 below the normal.

At most stations the precipitation was in excess of the normal. This was particularly true in a belt passing through middle Alabama. Rain fell frequently during the month. There was a slight fall of snow on the 28th, but, soon melting, its effects were inappreciable. The average precipitation was 0.55 above the normal.

Summary.

Temperature.—Monthly mean, 44.1; highest monthly mean, 50.4, at Tuscaloosa; lowest monthly mean, 40, at Florence; maximum, 81, at Troy, 17th; minimum, 17, at Motes, 29th; range for state, 64; greatest local monthly range, 59, at Troy; least local monthly range, 37, at New Market.

Precipitation.—Average for the state, 6.11; greatest, 9.48, at Auburn; least, 3.64, at Butler.

Wind.—Prevailing direction, northwest.—*P. H. Mell, Signal Corps, Auburn, director.*

ARKANSAS.

Summary.

Temperature.—Monthly mean, 41.6; highest monthly mean, 46.5, at Galveston; lowest monthly mean, 36.8, at Dallas; maximum, 79, at Washington, 17th; minimum, 5, at Eureka Springs, 28th; range for state, 74; greatest local monthly range, 61, at Eureka Springs; least local monthly range, 23, at Dallas.

Precipitation.—Average for the state, 5.78; greatest, 8.48, at Washington; least, 3.09, at Atlas—*Prof. John C. Branner, Little Rock, director; W. U. Simons, Corporal, Signal Corps, assistant.*

COLORADO.

Summary.

Temperature.—Monthly mean, 18.1; highest monthly mean, 30.4, at Cañon City; lowest monthly mean, 8.1, at Gunnison; maximum, 70, at Breckenridge, 14th; minimum, —25, at Saguache, 1st; range for state, 95; greatest local monthly range, 49.5, at Breckenridge; least local monthly range, 15.1, at Georgetown.

Precipitation.—Average for the state, 0.29; greatest, 1.24, at Glenwood Springs; least, trace, at Thon.—*Prof. F. H. Loud, Colorado Springs, director; T. W. Sherwood, Corporal, Signal Corps, assistant.*

ILLINOIS.

The remarkably high temperature of the present winter has continued through January and was even more marked than during December. The mean temperature, 30.7, was 8.5 above the mean of the previous eleven Januarys, and though largely in excess of the average cannot be said to have been phenomenally so, as it has been exceeded twice in the previous eleven years, in 1878 when it was 31.0, and in 1880 when it was 41.3.

The precipitation was slightly above the average; 0.20 above that of the eleven preceding Januarys, being lightest in northern and heaviest in the southern division. In the northern division it was mainly in the form of snow but in the other two the greater part of it was in rain. From 5 to 10 inches of snow fell in the western division and considerably less in the other divisions, but owing to the high temperature and the dryness of the atmosphere it soon disappeared and only traces remained at the end of the month. A general thunder-storm extended over the northern division on the 16th.

Wind.—Prevailing direction, southwest and northwest.—*Col. Charles F. Mills, Springfield, director; James Cassidy, Sergeant, Signal Corps, assistant.*

INDIANA.

Temperature.—The temperature during the month was uniformly high and its mean the highest noted since 1880, when the mean temperature for the state was 45.9, surpassing, by far, the mean, 32.5, of January, 1889. The mean temperature of January, 1874, 35.5, 1876, 38.6, and 1878, 34.5, were also much above the mean of the current month. The departure of the mean temperature for January, 1889, from the normal of six years is about +8 and from the normal of eighteen years, or more, about +5. At no time during the month, and, in fact during the winter, so far, has the temperature been reported 0. or below. The highest temperature was noted nearly everywhere on the 16th, and the lowest on the 21st.

Precipitation.—The precipitation for the state was slightly below the normal; it was below in the central and northern portions, more so in the latter, and slightly above the normal in the southern portion; it was badly distributed and the total measurements differ materially.—*Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.*

IOWA.

The month was fine and decidedly warm, westerly winds prevailing. Precipitation was normal, and mainly in the form of rain. The mean temperature was nearly 5 above normal. During the six years just preceding, January has been from 8 to 14 below normal, forming the coldest series on record for the state and the upper Mississippi valley; the mean of the preceding six Januarys is more than 10 below normal, consequently, the current month was nearly 15 above the average of the same month of the preceding six years. January, 1880, was over 10 warmer than the month just passed, and was the warmest January noted for the past fifty years. Since 1860, January has been five times as warm or warmer than in this year, namely, in 1880, 1878, 1876, 1869, and 1863, averaging once in four years. At the Central Station the

thermometer descended but once to zero (on the 21st), while in January, 1888, it ranged considerably below zero on twenty-two days.

Rainfall was nearly normal in amount, but fell mainly on the 15th and early on the 16th as a warm rain. In a belt running over Harrison, Polk, Benton, and Jackson counties, across the state, the rainfall during this storm exceeded 1.00. A moderate amount of snow fell on the 8th and 19th in most parts of Iowa. The total rainfall exceeded 1.00 in the east and was less than 1.00 in the west. It was greatest, exceeding 2.00, in a narrow belt running from Clermont over Hopkinton to Clinton.—*Dr. Gustavus Hinrichs, Iowa City, director.*

KANSAS.

The temperature has been above the normal in the middle and eastern divisions. In the southern counties the excess ranges from 6 to 10, while in the central and northern counties it is from 4 to 9. In the western division there is but one station, Dodge City, with a known normal, and here the temperature is but 0.3 above. The eastern division has been the warmest and the western the coldest.

There has been an excess of precipitation except in the extreme eastern and northeastern counties (Doniphan, Atchison, Jefferson, Leavenworth, Wyandotte, Johnson, Douglass, Shawnee, and Wabaunsee), and this excess increased towards the west. The eastern division received 36.0; the middle, 32.4; and the western 31.6 per cent. of the amount that fell.

In the counties from Barber and Sumner northeastward to Jefferson, inclusive, less than 1.00 fell; the other area, where less than 1.00 fell, covers Sherman and Thomas, the northern halves of Logan and Wallace, and the southern half of Cheyenne; 2.00 fell in Russell, Chautauqua, Montgomery, Labette, Cherokee, Crawford, Bourbon, Neosha, and the southeast half of Wilson.

Summary.

Temperature.—Monthly mean, 27.6; highest monthly mean, 35.3, at Rome; lowest monthly mean, 19.3, at Allison; maximum, 60, at Brookville, Bunker Hill, and Ellis, 7th, 29th, 7th; minimum, —9, at Colby, 18th; range for state, 69; greatest local monthly range, 66, at Concordia *b*; least local monthly range, 40, at Wa Keeney; greatest daily range, 41.9, at Topeka, 21st; least daily range, 3.3, 13th, at Leavenworth, and 19th at Concordia *a*.

Precipitation.—Average for the state, 1.19; greatest, 2.44, at Girard; least, 0.34, at Carneiro.

Wind.—Prevailing direction, northwest, *Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant Signal Corps, assistant.*

KENTUCKY.

Summary.

Temperature.—The monthly mean for the state, 37.1, is about 4 in excess of the normal. The mean daily maximum temperature was 45.7, and the mean daily minimum, 30.4. The average monthly range was 39.8. The highest temperature, 65, was recorded at Pellville, 18th, and the lowest, 13, at Ashland, 22d. The average warmest day in the month was the 16th, and the coolest the 29th. With the exception of January, 1876 and 1880, when the mean temperatures were 43.1 and 50.1, respectively, the past month was the warmest January since the opening of the central station in 1870.

Precipitation.—The average for the state, 3.52, shows a deficiency of about 0.75. This deficiency was, however, confined to the southern and western portions of the state. In the eastern and northern counties there was a considerable excess. The greatest precipitation reported was 5.66, at Lexington, and the least, 2.32, at Owenton. The snowfall was, as a rule, very light and unevenly distributed through the state. At no place did it remain upon the ground any considerable length of time.—*Dr. E. A. Grant, Louisville, director; Frank Burke, Sergeant, Signal Corps, assistant.*

LOUISIANA.

With the exception of the rainy spell from the 23d to 26th, the month was comparatively pleasant. The temperatures were not extreme either as to heat or cold, the average temperature for the state being 1 above the normal. The highest temperatures reported were generally a few degrees higher than usual for January, while the lowest temperatures were about an average for the month.

The dates of general rainfall were the 1st, 3d, 8th, 15–16th, 23d–26th, and 31st, the totals for the month varying from three to eight inches. The rains were generally heavier in the southern section, the average for that section being over 2.00 in excess of the average for the northern section. The average for the state was 0.3 above the January normal rainfall for Louisiana as determined from observations of past twenty years. There is but a difference of 0.80 in the normal January rainfall of the northern and southern portions of Louisiana (the southern section having the greater normal), showing that during the past month the northern section received about 1.00 less rain than usual, and the southern section about 1.00 more.

Snow fell in five of the northern parishes, but either melted as it fell or the few flakes were unmeasurable. Ice formation and killing frosts were frequently reported from the northern section, and a light frost occurred as far south as the Gulf on the 30th.

Summary.

Temperature.—Monthly mean, 50.3; highest monthly mean, 55.5, at Maurepas and New Iberia; lowest monthly mean, 45.5, at Grand Cane; maximum, 78, at New Iberia, 12th; minimum, 21, at Grand Cane, 21st, and at Clinton, 28th; range for state, 57; greatest local monthly range, 54, at Lake Providence and Rayville; least local monthly range, 35, at Shell Beach; mean daily range, 19.2.

Precipitation.—Average for the state, 5.63; for the northern section, 4.27; southern section, 6.54; greatest local monthly rainfall, 8.20, at the Sugar Experiment Station; least, 3.00, at the North Louisiana Experiment Station; daily rainfalls exceeding 2.50 in twenty-four consecutive hours, none; greatest daily rainfall reported, 2.40, at Arcadia, 16th.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

MICHIGAN.

The mean temperature for January is 5.3 above the normal of fourteen years. The temperature was above the normal in all sections; it was above the normal on twenty-four days, below the normal on six, and normal on one day. The highest mean daily temperature, 43, occurred on the 16th, when it was 22 above the normal, and the lowest, 14, on the 19th, when it was 7 below the normal. The highest mean daily temperature in the past fourteen Januarys, 56, occurred on the 1st, 1876, and the lowest, —8, on the 22d, 1883. The highest mean monthly temperature, 33.7, occurred in 1880, and the lowest, 14.5, in 1881. There have been but three years in which the temperature was higher than in this January, viz., 31.5 in 1876, 26.5 in 1878, and 33.7 in 1880.

The average precipitation for the month of January is 0.04 below the normal of fourteen years; it was above the normal in all sections but the southern, where the deficiency amounts to 0.18. The precipitation was general on the 6th, 9th, 10th, 16th, 20th, 27th, 30th, and 31st.

Summary.

Temperature.—Monthly mean, 26.4; highest monthly mean, 30.6, at Williamston; lowest monthly mean, 19.0, at Lathrop; maximum, 55.0, at Berlin and Petersburgh, 16th; minimum, —12.6, at Sault de Ste. Marie, 19th; range for state, 67.6; greatest local monthly range, 58.0, at Adrian, Lathrop, and Washington; least local monthly range, 36.0, at Sand Beach; greatest daily range, 46.0, at Omer, 29th; least daily range, 1.5, 7th, at Kalamazoo.

Precipitation.—Average for the state, 2.09; greatest, 4.00, at West Branch; least, 1.00, at Hayes.

Wind.—Prevailing direction, southwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, director.*

MINNESOTA.

The principal feature of the month was its extraordinary mildness. In southern and central Minnesota it was the warmest January in 7 to 9 years, and in the northern part of the state the temperature exceeded anything on record for 16 years. The precipitation over the state was nearly normal.

Summary.

Temperature.—The mean for the month, 15.6, is 11 above the January normal. The departures from the normal were greatest in the northern part of the state and least in the south. The highest temperatures were noted generally on the 2d and 16th, and the lowest on the 18th and 21st. The highest temperature recorded in the state during the month was 48 at Saint Vincent, 2d, and the same at Medford, 16th. The minimum was 36 below zero at Saint Vincent, 18th, giving a range for the month of 84.

Precipitation.—From 3.25 to 12.50 of snow are reported in the state during the month. The average fall at all statious is 7.50. The average of rain and melted snow for each station reporting is 1.00, which is nearly normal for the month of January. The precipitation was well distributed as to time, and geographically the fall was slightly in excess in northern Minnesota with a corresponding deficiency in the south. The amount of snow on the ground at the end of the month ranged from 0.50 at Saint Paul, Red Wing, and Medford to an average of about 8 in the upper part of the state.

Wind.—Prevailing direction, northwest.—*Prof. W. W. Payne, Northfield, director; John Healy, Private, Signal Corps, Saint Paul, assistant.*

MISSISSIPPI.

Summary.

Temperature.—The monthly mean for the state, 46, is about 2 above the normal. The highest local monthly mean, 52, at Logtown, and lowest, 41, at Macon. The highest temperature was 70 at Vicksburg and Pearlington, 16th, and the lowest, 21, at Batesville, 28th. The daily range at stations varied from 10 to 22 until the 28th and 29th, when it was only about 5 in the northern part of the state, and near the freezing point.

Precipitation.—The average, 5.24, is 0.26 less than the probable normal rainfall for January. Rainfall exceeding 1.00 in twenty-four hours was reported from nearly all stations on the 16th, and the catch on that day exceeded 2 at University, Pontotoc, Water Valley, and Macon. Almost continuous rainfall occurred from the 24th to the 27th, the wind being southeast. In the northern part of the state a trace of snow fell on the 18th, and enough to cover the ground on the 28th.

Wind.—Prevailing directions, south and southeast.—*R. B. Fulton, Signal Corps, University, director.*

MISSOURI.

Summary.

Temperature.—The mean temperature for January was 31.8. The highest temperature reported in the state was 69 at Ironton, and the lowest, —2, at Frankford. The average of maximum temperatures was 55.3, and the average of minimum temperatures, 6.1, making an average range of 49.2. The highest temperatures occurred on the 3d, 15th, 16th, 23d, and 30th, and the lowest on the 20th, 21st, 27th, and 28th.

Precipitation.—The average precipitation was 2.27, which was 0.66 above

the January normal. The greatest amount of precipitation reported was 4.61 at Cairo, Ill., and the least was 1.00 at Savannah. In the state as a whole, precipitation occurred on nineteen days. The greatest number of days of precipitation at any one place was thirteen, at Cairo, Ill.—*Prof. Francis E. Nipher, Saint Louis, director; G. A. Weber, Sergeant, Signal Corps, assistant.*

NEBRASKA.

The month has been prevailingly warm and pleasant with almost no severe weather, and with a good amount of precipitation, at least in southeastern Nebraska; the precipitation was mostly in the form of rain.

Summary.

Temperature.—The mean temperature for southeastern Nebraska was 23.5, which is 6 above the normal, and has not been exceeded since 1882. The maximum was 58, which is the highest recorded for January, with the exception of the last two years. The lowest temperature for the month was —16.

Precipitation.—Two areas of the state have received over an inch of rain, viz., the lower Niobrara basin and the region south of the Platte as far west as Red Willow County. At the extreme west of the state the rainfall was almost nothing.—*Prof. Goodwin D. Swezey, Crete, director; G. A. Loveland, Corporal, Signal Corps, assistant.*

NEVADA.

The first eleven days of the month were characterized by warm, sunshiny weather and a total absence of precipitation; from the 12th to the 18th there was a period of cold and rainy weather, nearly all of the precipitation for the month occurring between those two dates, but more particularly on the 18th, on which date thirteen out of a total of twenty-four stations reported precipitation in amounts ranging from 0.03 at Beowawe, to 0.86 at Tuscarora. The remainder of the month was attended by clear warmer weather, with very little precipitation.

Summary.

Temperature.—Although the monthly mean temperature, 28.7, was slightly below the normal, 31.7, for the past ten years, yet the weather, with but few exceptions, was generally mild and pleasant during the day, and the nights cold, especially so during the first ten and last five days of the month, the highest temperature, 56.6, occurring on the 9th. A cold wave passed over the station on the 18th and 19th, causing a fall in temperature of 40 in about 16 hours, from 33.8, at 2 p. m. of the 18th, to —7 the next morning, this being the lowest reading during the month. The range of temperature was 63.6.

Precipitation.—This was, comparatively speaking, a very dry month, the total amount of rainfall and melted snow, 0.10, indicating a deficiency of 1.68. It is the lowest on record since 1880, and is remarkably small when it is considered that as much as 5.57 of rain and melted snow fell during January, 1886. There were but two rainy days during the month, the 14th and 17th. The total deficiency for the season, from September 1, 1888, to January 31, 1889, is 3.30.

Wind.—Prevailing direction, northeast.—*Prof. Charles W. Friend, Carson City, director; E. H. Thompson, Private, Signal Corps, assistant.*

NEW ENGLAND METEOROLOGICAL SOCIETY.

The chief peculiarity of the month was its unusually high temperature, making it one of the warmest Januarys on record. The average temperature exceeded the normal by about 8, which has been rarely surpassed. January, 1880, was warmer in southern New England, and the temperature of this month in 1843, 1858, and 1870 was nearly the same as the current year. The month is in strong contrast with January, 1888, which was about 7 colder than the average, and at some stations the coldest month on record. The exceptionally high average of the past month was due to the uninterrupted period of warm days which extended from the 1st to the 19th. Maximum readings as high as 60 were noted. On account of the warm weather there was but little frost in the ground, and wild flowers began to bloom in favoring localities.

The snowfall was very light, the month in this respect also contrasting strongly with January, 1888. The precipitation as a whole, however, was equal to the monthly average, or a little greater, at the majority of stations.

Summary.

Temperature.—Monthly mean, 30.7 (100 stations); highest monthly mean, 38.0, at Block Island; lowest monthly mean, 22.1, at West Milan; maximum, 63, at Olneyville, 4th; minimum, —14, at Stratford, 23d; range for New England, 77; greatest local monthly range, 74, at Stratford; least local monthly range, 37, at Cotuit and Provincetown; greatest daily range, 49, at Stratford, 28d; least daily range, 0, at Walpole, 19th.

Precipitation.—Average for New England, 4.97 (131 stations); greatest, 7.64, at Fall River; least, 1.77, at Stratford.

Wind.—Prevailing direction, northwest (19 stations).—*Prof. William H. Niles, Boston, Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; Park Morrill, Sergeant, Signal Corps, assistant.*

NEW JERSEY.

Summary.

Temperature.—The mean for January, 36.2, is 6.7 above the average determined from past records of forty-nine stations, and 10.8 above the average for the corresponding month of 1888. The warmest days during the month were the 4th, 5th, 8th, 9th, 16th, and 17th, and the coldest, the 2d, 15th, 19th, 20th, 22d, 23d, 24th, and 30th. The lowest temperature recorded in the northern portion of the state was 8; in the central portion, 16; and in the southern portion, 21.

Precipitation.—The average for the state, 5.68, is 2.04 above the average determined from past records of forty-nine stations, and 0.91 above the average for the corresponding month of 1888. Three stations, Freehold, Oceanic, and Plainfield, report a total for the month exceeding 8.00; two stations, Tom's River and South Orange, a total exceeding 7.00; and nine stations a total exceeding 6.00. The snowfall during the month was phenomenally light; the greatest depth reported being 6.00 at Madison on the 20th. This station is the only one reporting snow on the ground at the close of the month (about 1.00).

Wind.—Prevailing directions, northwest and west.—*Prof. George H. Cook, New Brunswick, director; E. W. McGann, Sergeant, Signal Corps, assistant.*

NEW YORK.

Summary.

Temperature.—The highest temperature was 62, at Albany and Ardenia, 17th; the lowest, —12, at Saranac Lake, 15th. The mean temperature for the state was 28.7; the 17th being the hottest, and the 19th the coldest day. The temperature was above the normal at all stations.

Precipitation.—Average for the state, 4.22. The rainfall was above the normal at all stations except Albany, Cooperstown, Erie (Pa.), North Hammond, and White Plains, where a slight deficiency is reported. The greatest daily rainfall was 1.88, at Setauket, 6th. The average number of days on which 0.01 or more of rain or melted snow fell was 12.

Wind.—Prevailing direction, west.—*Prof. E. A. Fuertes, Ithaca, director; I. W. Brewer, Private, Signal Corps, assistant.*

NORTH CAROLINA.

Summary.

Temperature.—Monthly mean, 43.0; highest monthly mean, 48.0, at Hatteras, New Berne, and Wilmington; lowest monthly mean, 39.0, at Knoxville, Tenn.; highest temperature, 79.0, at New Berne, 14th and 17th; lowest, 14.0, at Lenoir, 30th; range for state, 65.0; mean monthly range, 45.0; highest monthly range, 59.0, at New Berne; lowest monthly range, 30.0, at Hot Springs; mean daily range, 17.0; highest mean daily range, 28.0, at New Berne; lowest mean daily range, 9.0, at Hatteras.

Precipitation.—Average monthly rainfall, 5.56; greatest monthly, 6.85, at Wilmington; least monthly, 3.50, at Lenoir

Wind.—Prevailing direction, northwest.—*Dr. Herbert B. Battle, Raleigh, director; H. McP. Baldwin, Sergeant, Signal Corps, assistant.*

OHIO.

The chief peculiarity of the month was its unusually high temperature, making it the warmest January on record.

Summary.

Temperature.—The mean temperature, 33.3, exceeded the average for the past seven years by 8.5. The mean of the northern section was 31.4; the middle section, 32.7, and the southern section, 35.8. The means are 8.8, 8.5, and 8.1 above the averages for the sections. The maximum temperature, 61, at Portsmouth, 23d, and the minimum, 8, at Wauseon, 29th. The mean daily range of temperature was 15.2. The greatest daily range was 49, at Westerville, 23d, and the least, 1, at Fostoria, 5th.

Precipitation.—Precipitation was general and heavy in all sections on the 5th, 6th, 9th, 16th, 20th, 27th, and 28th. Light local rains or snows occurred in all sections on the 8th, 21st, 24th, and 31st; in the northern section on the 7th, 11th, and 17th; the middle and southern sections on the 14th and 26th. The mean rainfall in the northern section was 2.73, and in the middle section, 3.45. These means are 0.18 and 0.10 above the averages for the sections. The mean in the middle section, 3.22, was 0.26 below the usual amount. The mean for the state, 3.13, agrees with the seven-year average for January. The greatest monthly rainfall was 4.80, at North Lewisburgh, and the least, 0.64, at Wapakoneta.—*Prof. B. F. Thomas, Columbus, director; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Private, Signal Corps, assistant.*

PENNSYLVANIA.

Summary.

Temperature.—The mean temperature for January, 1889, 31.9, is about 5 above the average, and 9.8 above that of January, 1888. The mean of the daily maximum temperatures was 31.6, and of the daily minimum temperatures, 27.2. The warmest period of the month was the 17th, and the coldest from the 19th to 23d, inclusive. The highest temperatures reported were Westtown, 68.0; Carlisle, 65.0; Reading, 64.5; McConnellsburgh, 64.0; Lancaster, 64.0, and New Bloomfield, 64.0. The lowest were Charlesville, —5; Emporium, —3; Honesdale, —3; Smethport, —2.5; Hollidaysburgh, —2; New Castle, —2; Coudersport and Wellsborough, —2. Stations with the highest monthly mean were Philadelphia, 37.3; Uniontown, 36.5; Pittsburgh, 35.2; Catawissa, 35; Pottstown, 35, and Indiana, 34.9. Those with the lowest were Eagles' Mere, 26.6; Honesdale, 27.8; Philipsburgh, 28.3; Greenville, 28.7; Coudersport, 28.6, and Clarion, 29.1.

Precipitation.—The average rainfall, including melted snow, was 3.54, which is slightly above the normal. The fall was very evenly distributed, both during the month and over the state. Light snow squalls were frequent. The heaviest snowfall occurred on the 20th. The greatest totals for the entire month were, Meadville, 21; Eagles' Mere, 19; Coudersport, 18; Somerset, 13; Wellsborough, 12, and Rimersburgh, 12. Very little snow remained on the ground at the end of the month.

Wind.—Prevailing direction, west.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant, in charge.*

SOUTH CAROLINA.

Summary.

Temperature.—The monthly mean, 44.9, is 1.3 below the mean of January, 1888; highest monthly mean, 52.3, at Timmonsville; lowest monthly mean, 41, at Camden; maximum, 78, at Cedar Springs, 17th; minimum, 15, at Spartanburg, 5th; monthly range for state, 63.

Precipitation.—Average for the state, 5.81; greatest monthly, 8.79, at Aiken; least monthly, 3.35, at Spartanburg; greatest daily, 2.14, at Brewers Mines, 4th; average number of rainy days, 9.6.

Wind.—Prevailing direction, northeast.—*Hon. A. P. Butler, Columbia, director; H. C. Seymour, Private, Signal Corps, assistant.*

TENNESSEE.

The month presented some rather abnormal features, the principal of which were the high average temperature and the low percentage of cloudiness.

Summary.

Temperature.—The mean temperature, 40.3, is the highest January mean during the period of six years from 1884, and more than 5 above the mean of the six years. The highest local mean was 43.7, at Parksville, and the lowest, 38.2, at Lewisburgh. The maximum temperature observed was 82 on the 13th, at Waynesborough, and was by 8 the highest January maximum during the past six years. The minimum observed was 13 on the 30th at Fostoria, and was by 11 the highest January minimum in the past six years, the next highest being 2 last year. The highest temperature was generally recorded on the 14th and 16th, and the lowest on the 28th, 29th, and 30th; on the first named date in the western division and the last in the eastern division, showing the movement of the cold wave from west to east. The ranges of temperature were about the normal, only, the greatest daily range, 48, was the greatest recorded in January during the six years.

Precipitation.—The mean precipitation for the month, 4.31, is more than 1.00 less than the January mean for the past six years. Some of this, especially during the latter days of the month, was in snow. The amount was pretty well distributed over the state, the western division receiving perhaps a slight excess. The great proportion of the amount fell during the latter half of the month, the last week showing an almost continuous record of rain or snow. The day of the greatest rainfall was the 16th. The greatest monthly rainfall at any station was 5.69 at Lawrenceburgh, and the least, 2.90, at Clarksville. The greatest local daily rainfall was 2.58 on the 16th at Trenton. There were eight days on which no measurable rainfall was reported. Snow reported on nine days, but mostly light and melting as it fell. In a few instances the fall was sufficient to measure, Clarksville showing the greatest depth, 3.00.

Wind.—Prevailing direction, northwest.—*J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.*

TEXAS.

The month of January was remarkably wet. There was scarcely a day that rain was not reported at some of the stations in the state.

Summary.

Temperature.—The average for January was about normal. The mean for the state, 47.5, is 4.2 lower than the average of last month. The mean maximum temperature was 57.3, and the mean minimum, 38.6. The highest temperature reported from any station was 81.6, on the 15th, at Gallinas, and the lowest, 11, on the 27th, at Silver Falls, the absolute range for the state being 70.6. The greatest monthly range of temperature at any station was 60.1, at Gallinas, and the lowest monthly range, 36, at Fort Worth. The average range for the state was 46.9. There were a few days that the mean daily temperature was below 38, and only two days that it was above 60.

Precipitation.—The average rainfall for January was 6.31, which is considerably in excess of the normal. The greatest precipitation in any consecutive twenty-four hours at any station occurred on the 15th, at Ingersol, 3.29. The greatest monthly precipitation, 13.65, was reported at Tyler; the least, 0.76, at El Paso.

Wind.—The prevailing winds were east and southeast along the coast; in the interior, east and northerly.—*S. O. Young, M. D., Galveston, director; Allen Buell, Sergeant, Signal Corps, assistant.*

ERRATA.

Errors, other than those noted in error sheet for excessive precipitation, published in REVIEW for December, 1888, have been detected as follows: October, 1887, page 281.—Precipitat Bird's Nest, Va., should be, average for October, 3.26; total for October, 1887, 6.35; deviation from average, +3.09. December, 1887, page 330.—Excessive daily rainfall at Clarksville, Tex., 8.50, should be omitted; page 326.—Extreme monthly precipitation at Dale Enterprise, Va., should be 6.81 in 1881, instead of 12.63 in 1885. February, 1888, page 56.—Minimum temperature at Utica, N. Y., should be —11, instead of —21. March, 1888, page 60.—In table, barometer range at New Haven should be .31, instead of .51; page 69.—Excessive precipitation data for Savannah, Florence Station, and Austin, Tenn., under heading 10 inches, or more, should be transposed to column of 2.50 inches, or more, etc. April, 1888, page 99, Alabama State Weather Service, precipitation, should be, greatest, 9.96, at Pineapple; least, 4.70, at Eufaula, instead of as printed. July, 1888, page 159 and August, 1888, page 186.—The expression, tri-daily weather maps, should be twice daily etc. September, 1888, page 214.—In barometer ranges, Sanford, Fla., should be Titusville, Fla.; page 220.—Statesburgh, Smith Co., should be Sumter Co.; page 231.—Reily, McHenry Co., should be Riley; page 244.—Year 1849, first mentioned, should be 1839. November, 1888, page 279.—In list of places having 3 inches or more of snowfall, Utica, N. Y., 4.50, should be added; page 290.—In table, precipitation at Ash Canyon, Ariz., 1.03, should be omitted; page 290.—In table, rainfall at Greeley, Colo., 4.80, should be, 0.48.

Meteorological record of voluntary observers and Army post surgeons, January, 1889.

The observations at stations marked thus (*) are from readings of Signal Service instruments.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Alabama.	°	°	°	*Ins.*
Bermuda* †	66	24	47.0	7.80
Butler*	69	24	44.9	3.64
Citronelle*	73	27	51.9	7.13
Florence†	58	19	40.0	3.41
Gadsden*	62	19	42.5	6.36
Greensborough	66	26	47.1	5.40
Livingston*	67	26	46.4	4.47
Mt. Vernon B'ks	71	24	50.5	7.09
Motes*	66	17	44.6	6.82
New Market*	61	18	41.6	5.78
Selma	72	26	48.2	.....
Talladega	64	21	47.0	7.45
Troy*	81	22	50.1	8.24
Tuscaloosa	66	21	50.4	6.11
Tuscumbia	63	21	42.8	5.33
Union Springs	71	26	47.0	8.39
Uniontown	66	26	49.3	5.07
Arizona.				
Antelope Valley	.....	.....	.....	1.93
Ash Canyon	.....	.....	.....	1.80
Benson†	65	30	45.3	0.93
Casa Grande†	71	35	51.0	?
Cedar Springs	.....	.....	.....	2.16
Eagle Pass†	58	19	36.0	1.84
Florence	67	26	47.6	1.26
Fort Apache	52†	6	31.1†	?
Fort Huachuca	54	23	38.3	1.90
Fort Lowell	72	25	40.9†	2.09
Fort McDowell	72	25	47.3	2.66
Fort Mojave	68	30	46.6	4.15
Fort Verde	62	15	38.5	2.90
Globe	62	20†	.....	2.15
Holbrook †	53	7	31.7	0.30
Mount Huachuca †	56	19	32.2	2.37
Pantano†	58	27	40.2	1.59
Peoria	65	30	47.0	1.56
San Simon†	70	30	44.5	?
Teviston	.....	.....	.....	1.20
Tucson (1)	77	30	52.6†	1.74
Tucson (2)†	70	38	57.4	?
Whipple Barracks	54	—10	28.0	1.73
Wilcox †	65	25	45.8	1.15
Williams	50	0	24.6	0.70†
Willow Springs	.....	.....	.....	2.04
Arkansas.				
Alexander	61	18	39.6	7.77
Altus	60	13	39.7	3.09
Arkansas City*	.....	.....	.....	5.04
Camden*	.....	.....	.....	8.57
Conway	64	21	41.3	5.84
Dallas*	50	27	36.8	8.12
Dayton*	63	15	42.7	4.40
El Dorado*	66	19	41.6	7.00
Eureka Springs	66	5	39.2	3.85
Forrest City	66	19	45.6	6.26
Fulton*	.....	.....	.....	4.46
Galveston*	68	21	46.5	.....
Heber	65	15	39.3	6.75
Helena* (1)	.....	.....	.....	5.66
Helena (2)	64	21	42.3	3.80
Hot Springs	.....	15	.....	4.40
Lead Hill	65	11	38.1	3.78
Little Rock B'ks	66	20	43.4	7.30
Lonoke	67	24	46.2	7.50
Newport*	.....	.....	.....	6.15
Ozone*	59	9	38.7	5.76
Portia*	68	18	40.8	4.70
Stuttgart*	65	22	42.7	1.42
Texarkana	67	20	44.8	4.11
Washington*	79	21	44.2	8.48
British Columbia.				
New Westminster	47	24	35.9	5.99
California.				
Alcade †	60	30	43.7	0.50
Alcatras Island	61	42	49.3	0.54
Almaden†	68	31	50.5	0.55
Anaheim†	74	34	57.8	0.14
Angel Island	73	39	55.4	1.68
Antioch †	65	30	43.6	0.95
Aptos †	65	30	48.6	0.50
Athlone†	69	28	45.9	0.36

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
California—Cont'd.	°	°	°	*Ins.*
Auburn †	64	27	44.6	0.33
Bakersfield †	62	30	46.0	0.57
Benicia Barracks	71	31	45.6	0.94
Banning*	76	30	48.8	0.98
Barstow †	62	19	42.5	0.14
Bordent	61	30	45.1	0.15
Boulder Creek†	65	23	44.7	1.24
Brentwood†	69	29	45.3	0.48
Brighton†	69	30	46.2	0.00?
Byron†	64	30	46.2	0.71
Cactus†	92	42	61.3	.....
Caliente†	66	28	47.8	?
Calistoga†	67	24	46.0	0.96
Castroville†	63	32	48.5	0.69
Colegrove	.....	.....	.....	0.10
Coles †	60	11	34.0	?
Colfax†	64	28	43.2	0.50
Corning†	54	30	44.8	0.27
Davisville †	64	32	46.1	0.20
Delano †	68	29	46.4	0.63
Delta.†	68	27	44.3	0.15
Downey†	69	34	51.0	0.60
Dunsmuir †	70	22	41.0	0.30
Dunnigan †	66	27	43.4	0.27
El Dorado †	65	28	43.8	0.31
Elmira†	70	31	49.0	0.32
El Verano†	70	28	47.8	1.16
Emigrant Gap.†	56	20	35.7	?
Esperanza.†	54	30	40.2	0.35
Farmington†	63	29	44.7	0.39
Felton †	71	24	47.5	1.16
Florence †	84	34	55.0	0.37
Folsom †	64	27	44.7	0.32
Fort Bidwell	45	— 2	25.8	2.81
Fort Mason	61	39	46.6	1.11
Fruto †	71	32	47.3	0.82
Georgetown*	62	25	43.2	0.66
Gilroy †	65	28	46.0	0.46
Girard†	67	26	41.8	0.05
Goshen †	62	29	44.6	0.39
Glen Ellen†	70	27	46.3	1.56
Hanford †	64	30	43.0	0.31
Hollister †	77	29	47.6	0.88
Hornbrook†	55	2	33.2	?
Hydesville *	66	27	44.4	4.55
Ione †	72	24	46.6	0.12
Kings City†	70	25	46.0	0.92
Keene †	66	25	41.6	0.36
Knight's Landing†	57	32	43.9	?
Lathrop†	68	30	44.1	0.32
Laurel †	65	30	48.1	0.62
Lemoore†	59	30	41.7	0.27
Livingston†	62	32	46.6	0.27
Long Beach †	76	31	52.4	?
Los Angeles†	68	28	49.9	0.22
Mammoth Tank†	75	30	51.2	0.62
Martinez†	69	29	45.8	1.05
Marysville†	75	34	53.1	?
Menlo Park†	64	32	47.5	0.65
Modesto	68	32	45.0	0.45
Montague†	54	0	33.7	?
Monterey †	70	29	49.8	0.81
Napa†	59	26	44.9	0.87
Needles	67	32	49.8	3.36
Newark†	64	32	48.8	0.42
Newman †	65	30	48.3	0.51
Niles†	70	33	50.4	0.46
Norwalk†	70	28	48.2	0.22
Oakland (1)	62	34	47.7	0.90
Oakland (2)†	64	34	47.7	1.15
Oroville	71	32	47.0	0.16
Pajaro†	71	30	49.0	0.56
Paso Robles†	67	22	41.6	0.78
Placerville†	59	26	41.3	0.55
Pomona†	80	35	57.3	0.51
Presidio of San F.	60	36	50.2	1.18
Puente†	70	28	49.5	0.04
Red Bluff †	80	31	46.9	0.23
Redding.†	65	30	45.5	?
Rocklin †	62	29	43.6	0.07
Rumsey.†	65	30	47.4	0.95

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
California—Cont'd.	°	°	°	*Ins.*
Sacramento (1)	60	24	40.2	0.19
Sacramento (2)†	58	31	43.7	0.06
Salinas (1)†	64	28	44.9	0.65
Salinas (2)†	61	28	44.0	0.77
Sanger Junction†	63	26	45.2	0.47
Salton†	85	40	.....	?
San Ardo†	60	28	46.4	0.83
San Diego B'ks	71	36	52.9	1.68
San Gabriel†	72	30	52.6	0.08
San José†	62	32	47.6	0.50
San Mateo†	62	32	45.5	1.17
San Miguel†	63	26	45.6	0.80
Santa Anna†	74	34	55.7	0.31
Santa Barbara (1)	68	38	53.0	0.29
Santa Barbara (2)†	70	36	51.9	0.30
Santa Cruz†	70	34	50.9	0.99
Santa Maria	70	28	48.7	0.42
Santa Monica†	67	36	50.7	0.23
Santa Paula†	78	38	56.2	0.65
Santa Rosa†	69	28	46.8	1.77
Selma†	60	29	42.7	0.36
Seven Pines†	81	37	55.6	0.30
Sims†	65	20	38.4	0.42
Sisson†	54	11	34.8	?
Soledad†	66	26	44.2	0.69
Soquel†	70	30	48.5	?
South Side†	70	32	49.6	0.70
South Vallejo†	68	31	48.3	0.88
Stockton†	56	34	45.1	0.25
Suisun	62	34	48.7	0.50
Susanville†	48	7	29.7*	0.03
Tehama†	72	34	50.2	0.20
Tehachapi†	50	20	35.5	?
Templeton†	66	24	44.9	0.78
Towles†	62	22	40.6	?
Tracy†	50	30	40.7	0.60
Traver†	55	24	37.8	0.36
Tropico†	70	30	48.9	0.17
Truckee†	46	— 6	23.1	?
Tulare†	65	30	45.9	0.74
Turlock†	62	32	46.9	0.31
Vacaville†	66	31	45.3	0.44
Valley Springs†	61	30	45.0	0.29
Vina†	65	30	45.8	0.09
Volcano Springs†	78	30	54.2	0.82
Westley†	65	31	48.5	?
Whittier†	70	39	54.3	0.15
Williams†	58	34	45.2	0.32
Willow*	58	27	41.8	0.38
Winters†	69	34	47.5	0.36
Woodland†	60	29	44.0	?
Colorado.				
Alma	39	—10	13.6	0.33
Aspen	.....	.....	13.5	0.45
Breckenridge	70	—20	.....	.....
Cañon City	.....	.....	30.4	0.29
Castle Rock	60	—12	19.6	0.42
Coulter†	50	—22	9.4	1.02
Delta†	50	0	15.4	0.41
Denver (near)	60	2	27.8	?
Durango†	.....	.....	.....	1.70
Fort Collins	58	— 4	21.3	0.22
Fort Crawford	45	—10	21.0	2.36
Fort Lewis	45	—12	17.8	1.62
Fort Lyon	56	—16	19.5	0.53
Georgetown	44	2	23.8	0.19
Glenwood Springs	46	— 8	18.1	1.24
Greeley (1)†	43	— 5	21.5	0.30
Greeley (2)	53	— 5	21.1	.....
Gunnison	.....	.....	8.1	0.29
Husted	.....	—10	.....	0.54
Idaho Springs	53	— 2	23.6	0.22
Julesburg	58	.....	22.8	0.08
Leadville	38	— 9	13.9	0.52
Lamar	.....	.....	.....	0.09
Longmont	64	— 3	21.0	0.21
Palmer Lake	52	3	.....	0.62
Paoli	.....	.....	22.8	0.14
Ranch near Como	42	— 8	16.0	0.47
Saguache	.....	—25	11.0	0.57
Rocky Ford (1)	52	—11	21.2	0.36
Rocky Ford (2)	.....	.....	18.8	0.36
T. S. Ranch	.....	.....	23.0	0.33
Thon	.....	.....	18.6	.....
Waldon	.....	.....	13.1	0.12
Connecticut.				
Canton	56	6	.....	5.15
Clark's Falls	.....	.....	.....	5.89
Colchester	57	9	32.7	.....
Fort Trumbull	56	13	37.2	3.53
Hartford (1)	56	3	31.1	4.98
Hartford (2)	.....	.....	.....	4.95
Lake Konomoc	.....	.....	.....	6.15
Mansfield	57	5	30.8	4.03
Middletown	56	10	32.6	5.64
New Hartford* (1)	52	— 2	26.0	4.43
New Hartford* (2)	.....	.....	.....	5.00
Shelton	55	12	31.5	6.87
Southington	56	3	30.1	5.65
Thompson	55	5	30.3	.....
Uncasville	.....	.....	.....	6.16
Voluntown†	55	10	33.7	6.12
Wallingford	.....	.....	.....	5.17
Waterbury	53	4	30.9	5.85

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Dakota.	°	°	°	*Ins.*
Brookings	44	—24	13.6	1.05
Davenport	42	—30	10.8	0.58
Fort A. Lincoln	44	—19	13.9	0.10
Fort Bennett	44	—21	17.9	.....
Fort Meade	48	— 3	22.2	0.27
Fort Buford	46	—20	11.8	0.13
Fort Pembina	51	—27	7.1	0.34
Fort Randall	45	—15	20.4	0.75
Fort Sisseton	34	—25	9.8	0.46
Fort Sully	46	—14	16.9	0.67
Fort Totten	45	—25	12.0	0.24
Fort Yates	45	—17	14.2	0.45
Gallatin*†	44	—32	5.4	.....
Garden City†	36	—21	*12.0	0.62
Goddard†	40	2	16.1	.....
Grand Forks	36	—31	10.4	1.22
Kimball*†	.....	—18	13.2	1.10
New England City*†	39	—25	9.6	0.50
Parkston	50	—22	10.5	1.02
Spearfish*†	55	— 3	24.5	0.75
Spring Lake*†	52	—14	16.1	0.75
Webster*	38	—26	10.9	3.34
Woonsocket	45	—29	12.3	0.80
Delaware.				
Kirkwood†	58	22	34.0	.....
Newark	60	19	36.0	4.48
Viola*	60	22	36.8	4.65
District of Columbia.				
Distribut'g Res.*†	.....	.....	.....	5.36
Kendall Green*†	58	23	37.3	4.41
Receiving Res'v'r*†	.....	.....	.....	4.91
Florida.				
Altamonte Springs*	78	34	59.0	11.15
Alva*	88	38	65.2	5.31
Fort Barancas	.....	.....	.....	8.05
Fort Meade*†	80	32	56.0	8.25
Kissimmee City*	79	34	61.0	7.53
Manatee*	83	38	63.0	7.59
Matanzas	74	34	56.8	6.52
Merritt's Island*	78	38	61.0	10.21
St. Francis B'k's	75	32	56.5	8.25
Tallahassee*	74	26	51.8	8.85
Villa City*†	80	35	61.0	9.16
Georgia.	°	°	°	*Ins.*
Athens	67	22	43.9	5.84
Duck*	60	14	38.8	5.72
Forsyth	78	26	49.2	8.86
Hephzibah*†	68	30	50.4	10.24
Marietta*	60	18	41.3	6.52
Milledgeville*	68	24	43.2	6.93
Quitman	75	37	53.2	10.40
Idaho.				
Boisé Barracks	40	2	21.1	T.
Fort Sherman	38	5	24.8	3.49
Lewiston	46	10	30.8	0.41
Illinois.				
Aledo	58	— 8	27.0	1.37
Atwood	56	0	30.7	2.18
Aurora	53	— 4	26.7	2.06
Beason	55	— 1	33.1	1.72
Belvidere	50	— 6	24.9	1.36
Benton	56	9	29.0	3.39
Brush Hill	60	— 2	31.6	2.28
Cedarville	48	— 7	23.5	1.39
Centralia	60	12	33.0	3.52
Charleston	58	6	31.7	1.80
Collinsville	62	12	33.6	.....
Dwight	57	— 8	28.2	1.47
Fairfield	62	18	37.3	2.65
Flora	60	14	34.0	2.60
Fort Sheridan	49	3	21.7	.....
Gibson City	53	— 3	28.8	1.36
Golconda	58	16	37.1	4.54
Grand Tower*	.....	.....	.....	2.69
Greenville	62	9	32.9	2.65
Griggsville	60	2	29.2	2.84
Hennepin	58	— 3	26.4	1.65
Irishtown	63	13	33.8	2.76
Jordan's Grove	62	16	33.9	3.55
Kampsville	60	14	31.9	1.93
Kankakee	50	— 5	29.1	1.54
Lacon	57	4	29.8	2.28
Lake Forest	50	— 1	26.8	1.62
Lake View	52	— 2	28.0	2.22
Lanark	46	— 3	26.0	1.66
Mahomet	55	3	31.4	1.67
Makanda	61	16	36.7	3.75
Martinsville	50	10	31.9	1.01
Mascoutah	60	10	32.0	2.65
Mattoon†	63	6	31.8	1.85
McLeansborough	62	16	35.1	3.20
Mount Carmel*	.....	.....	.....	3.24
Mount Morris†	51	— 8	24.4	3.10
Nunda	65	— 4	25.3	1.40
Old DuQuoin	60	17	35.5	1.80
Olney	52	13	33.4	2.73
Oneida	56	— 6	26.5	1.73
Oquawka	55	— 6	31.3	2.62
Oswego†	52	— 6	26.6	1.57
Ottawa	57	— 6	26.2	1.91
Palestine*	59	14	33.5	2.72
Pana	62	12	35.7	2.73
Paris	54	7	30.6	1.35
Pekin	60	— 3	31.1	2.15

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Illinois—Cont'd.	°	°	°	*Ins.*
Peoria	60	0	30.6	1.70
Petersburgh	62	4	34.5	.....
Philo†	56	2	31.0	1.23
Pontiac	54	— 4	28.9	1.39
Richview	61	13	34.5	3.27
Riley†	48	— 6	24.0	1.86
Rock Island Ars'l	55	— 4	27.7	4.20
Rockford	46	— 4	25.1	2.96
Rushville	57	1	29.7	1.70
Sandwich†	55	— 5	28.7	2.27
South Evanston	52	— 3	25.8	1.57
Sumner	58	10	34.0	3.20
Sycamore†	49	— 4	26.8	1.13
Vandalia	58	14	32.5	2.20
Warren	43	2	21.0	2.40
Watseka	56	— 3	29.2	1.39
Wheaton	48	— 6	26.9	....
White Hall	60	6	31.1	2.12
Willow Hill	56	14	34.5	1.83
Windsor*	58	5	32.5	1.97
Winchester	63	— 6	32.9	2.88
Winnebago	52	— 8	23.5	2.18
Woodstock	49	—11	23.4	2.25
Indiana.				
Angola	52	9	30.0	1.44
Blue Lick	55	17	36.2	3.04
Butlerville†	56	16	35.7	3.62
Cannelton	58	19	37.1	3.63
Columbia City	55	2	28.9	1.78
Columbus	52	16	33.9	2.80
Connersville	53	10	31.9	3.09
De Gonia Springs	57	20	37.5	3.30
Delphi	58	2	30.5	1.26
Evansville*	.....	.....	.....	0.36
Farmland	54	6	32.9	1.78
Franklin	54	11	32.6	2.64
Huntingburgh	58	18	35.5	4.35
Huntington*	.....	.....	.....	1.88
Jeffersonville	57	21	36.1	3.34
La Fayette	58	1	30.3	1.05
Lagrange*	52	4	28.2	1.50
Logansport*	.....	.....	.....	1.09
Marengo	61	22	38.6	4.96
Marion	55	4	29.2	2.20
Muncie	54	10	32.7	.....
Mauzy	54	4	29.6	3.17
Mount Vernon	57	19	37.2	3.98
New Providence	58	15	37.26	3.25
Pana	50	6	.....	1.30
Princeton	57	15	*35.3	3.30
Richmond	55	8	31.4	2.45
Rockville	48	7	31.0	2.70
Rushville*	.....	.....	.....	3.28
Salem†	56	17	33.2	3.68
Scalesville	56	19	37.2	2.78
Sunman*	55	10	33.4	3.49
Seymour	56	20	36.9	3.50
Spiceland	56	12	34.4	2.87
Vevay	58	15	37.0	2.82
Vincennes*	.....	.....	.....	3.80
Worthington	56	12	31.6	2.72
Indian Territory.				
Caddo Creek†	76	5	49.8	.....
Cantonment*	.....	.....	.....	0.96
Eufaula*	.....	.....	.....	3.21
Fort Gibson	64	8	40.8	4.54
Fort Reno	59	10	36.8	1.79
Fort Supply	62	12	32.8	0.90
Jimtown*†	74	15	51.4	4.30
Tulsa*	.....	.....	.....	3.54
Woodward*	.....	.....	.....	0.90
Iowa.				
Albion	45	—25	20.3	0.79
Amana*	48	— 8	20.4	1.48
Bancroft†	41	— 7	15.6	1.05
Blakeville	.....	— 4	18.3	.....
Cedar Rapids	50	— 6	22.4	1.44
Clarinda†	44	0	23.7	1.50
Clinton	54	— 8	24.4	2.05
Cresco	39	—13	17.6	1.55
Cromwell†	39	2	22.0	1.80
Denmark†	52	.....	.....	1.68
Des Moines	50	— 3	21.9	.....
Dunkerton†	.....	.....	23.1	.....
Dysart†	45	—10	20.1	1.10
Elkader† (1)	46	—14	21.0	1.45
Fayette*	47	—13	18.6	1.19
Fort Madison†	56	— 2	27.7	*1.64
Gillett*†	37	— 7	14.8	0.79
Glenwood† (1)	44	— 4	24.5	0.18
Glenwood† (2)	48	— 4	23.7	1.33
Grinnell*	45	— 2	21.6	1.00
Hampton†	39	— 6	17.9	1.10
Humboldt†	40	—10	18.5	0.89
Independence†	42	— 2	21.0	1.23
Iowa City	49	1	24.6	2.19
Logan*	48	0	24.1	1.49
Maquoketa†	52	.....	.....	1.80
Manson†	44	8	19.2	1.45
Monticello†	46	— 6	22.3	*1.72
Mount Pleasant*†	55	0	26.0	0.75
Mount Vernon†	51	— 6	23.7	.....
Muscatine†	53	— 9	25.8	1.43
Osage	.....	.....	.....	1.52
Osceola†	35	— 7	16.5	1.60

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Iowa—Cont'd.	°	°	°	*Ins.*
Sac City†	43	— 8	18.7	2.15
Vinton†	45	— 6	21.2	0.70
Washington	55	— 4	26.8	1.33
Wesley*	†40	— 8	17.5	0.50
Kansas.				
Allison†	54	— 2	19.3	1.82
Arlington	.....	.....	.....	1.25
Belleville	47	.....	33.0	.....
Bendena†	.....	16	32.2	1.00
Bucklin	.....	.....	.....	1.30
Buffalo Park	54	4	.....	.....
Brookville	60	10	.....	1.80
Bunker Hill	60	10	.....	2.00
Burr Oak	50	5	20.6	1.35
Carneiro	56	11	.....	0.34
Cawker City	51	0	24.9	1.00
Cedar Point	.....	.....	.....	0.78
Colby	53	— 9	19.9	0.89
Cold Water	57	8	28.8	1.20
Collyer	52	8	.....	.....
Concordia	58	— 8	26.6	1.40
Conway	.....	.....	.....	1.05
Cunningham†	57	10	28.5	0.75
Dorrance	58	9	.....	0.50
Ellis	60	16	.....	.....
Elk Falls*	60	7	35.5	1.35
Ellsworth	57	12	.....	1.70
Emporia	54	4	31.4	T.
Englewood†	58	12	31.2	1.21
Fort Hays	56	5	36.7	1.56
Fort Leavenworth 1	52	3	29.3	1.35
Fort Leavenworth 2	52	4	29.9	.....
Fort Riley	51	0	28.8	1.11
Gibson	55	4	23.9	1.20
Girard	56	6	33.6	2.44
Globe†	51	4	29.3	0.94
Gorham	58	10	.....	.....
Grainfield	54	14	.....	0.70
Grinnell	56	4	.....	0.50
Grenola	54	13	32.8	1.05
Gove City	50	1	23.4	1.20
Halstead	54	8	31.3	0.73
Havensville†	48	2	26.0	1.85
Haven	.....	.....	.....	0.77
Hays City	57	10	.....	1.26
Hugoton	52	10	29.6	1.10
Independence†	55	7	34.0	2.15
Junction City	.....	.....	.....	1.43
Kanopolis	56	10	.....	.....
Kirwin*	.....	.....	.....	0.88
La Harpe†	.....	10	33.0	1.25
Lawrence	49	7	30.3	0.79
Lebo	54	5	30.0	0.90
Leoti*	.....	— 6	.....	1.02
Macksville	55	10	32.3	1.75
Manhattan†	48	— 2	26.6	0.86
McAllaster	50	— 8	.....	0.30
McPherson	.....	.....	.....	0.60
Montero	52	— 4	24.3	0.40
Monument	56	0	.....	0.75
Morse†	50	0	28.2	1.25
Oakley	52	2	.....	0.90
Oberlin*	.....	.....	.....	0.78
Ogallah	55	15	.....	.....
Quinter	52	5	.....	.....
Rome	55	10	35.3	0.61
Russell	56	10	.....	.....
Salina	57	8	31.3	1.40
Santa Fé*	63	5	32.4	.....
Sedan†	58	6	34.5	2.08
Seneca	48	— 6	25.5	1.36
Sharon Springs	.....	.....	.....	1.24
Tribune*	53	— 8	20.2	1.11
Victoria	54	12	30.8	0.27
Wakefield†	51	3	30.0	1.70
Wa Keeney	50	10	.....	.....
Walker	54	9	.....	.....
Wallace*	.....	.....	.....	0.51
Washburn College	53	3	26.0	0.63
Wellington	55	10	33.4	0.96
Winona	56	10	.....	0.40
Wilson	57	10	.....	1.26
Yates Centre†	54	4	31.5	1.17
Kentucky.				
Ashland*†	.....	13	33.3	3.40
Bowling Green*	61	16	40.2	2.79
Catlettsburgh*	.....	.....	.....	4.38
Eddyville*	.....	.....	.....	3.02
Falmouth*† (1)	54	19	34.3	3.69
Falmouth* (2)	.....	.....	.....	3.36
Franklin*†	64	21	39.9	3.58
Frankfort (1)	57	19	36.7	*3.30
Frankfort* (2)	.....	.....	.....	2.71
Greensburgh*	.....	.....	.....	4.11
Louisa*	.....	.....	.....	3.00
Madisonville*†	59	20	37.8	3.27
Millersburgh*	60	23	41.3	2.71
Mount Sterling*†	56	17	36.0	4.46
Newport Barracks	58	18	36.0	2.90
Owenton	55	18	38.1	2.32
Owensborough*	60	20	36.8d	.....
Paducah*	.....	.....	.....	3.64
Pellville*	65	17	39.4	2.71
Richmond*	58	18	38.0	3.67
Shelbyville*	56	20	36.5	.....

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Kentucky—Cont'd.	°	°	°	*Ins.*
South Fork *†	64	20	37.7	5.80
Williamsburgh *	.....	.....	.....	3.95
Louisiana.				
Amite City	74	36	50.9	7.05
Arcadia	76	24	47.5	5.50
Abbeville	72	32	52.2	5.23
Alexandria	.....	.....	.....	5.51
Baton Rouge	70	31	49.9	6.24
Cheneyville	72	25	50.5	4.15
Calhoun	69	.....	.....	3.00
Clinton	72	21	46.6	7.10
Convent	73	29	50.0	6.50
Coushatta*	.....	.....	.....	5.85
Crowley	70	27	48.9	6.15
Delhi *	.....	.....	.....	5.50
Farmerville	68	26	47.1	4.65
Franklinton	74	31	54.1	6.48
Girard *	.....	.....	.....	2.45
Grand Cane	68	21	45.5	3.60
Grand Coteau	70	33	52.9	5.70
Hammond	73	27	49.8	5.26
Houma*†	71	33	52.3	7.23
Jennings	.....	.....	.....	6.70
Lake Charles	70	33	53.3	7.13
Lake Providence	76	32	49.7	5.02
Liberty Hill	72	23	48.0	5.08
Luling	73	29	49.8	6.78
Mandeville	70	29	53.1	6.04
Maurepas	76	32	55.5	5.95
Marksville*†	70	29	50.5	4.41
Melville *	.....	.....	.....	5.56
Minden	74	22	49.6	4.00
Monroe	68	27	47.9	4.17
Mount Airy	72	33	52.4	5.88
New Iberia	78	32	55.0	6.11
Plaquemine	73	24	48.8	6.94
Point Pleasant	70	28	47.3	4.50
Rayville	78	24	48.6	4.00
Saint Joseph	70	26	47.3	5.90
Saint Martinville	71	33	52.2	7.51
Shell Beach	65	30	51.0	.....
Sugar Ex. station	71	34	50.7	8.20
Thibodeaux	72	27	.....	6.45
Trinity	70	28	48.4	3.00
Vidalia	76	26	50.3	3.83
Maine.				
Bar Harbor	51	2	29.2	4.83
Belfast	49	4	27.4	.....
Calais	50	— 4	24.7	4.17
Cornish	51	2	25.7	5.10
Fairfield	52	—13	23.2	2.91
Gardiner	53	3	26.7	5.20
Kent's Hill	51	0	25.2	3.78
Lewiston	48	— 3	24.1	4.67
Orono *	52	— 2	24.7	5.37
Petit Menan	43	2	29.9	.....
Maryland.				
Barren Creek Spgs *	62	22	39.6	3.97
Cumberland	58	10	34.7	3.01
Fort McHenry	58	23	37.6	5.76
Frederick	66	17	37.2	3.87
Gaithersburgh †	52	18	32.8	.....
Galena *†	57	25	36.5	4.49
Great Falls†	.....	.....	.....	5.01
Jewell†	59	25	38.3	2.73
McDonogh	62	18	38.2	3.49
Mt. St. Mary's Col*	68	16	35.4	4.84
Woodstock	64	12	35.8	3.85
Massachusetts.				
Amherst Ex Sta	58	0	30.3	3.29
Amherst	61	4	32.3	3.50
Beverly Farms	51	0	30.6	6.40
Blue Hill Obs'y (1)	56	4	31.6	6.11
Blue Hill Obs'y (2)	59	5	33.0	6.47
Blue Hill Obs'y (3)	57	7	32.8	6.81
Boston	.....	.....	.....	6.18
Brewster	55	12	35.8	4.55
Cambridge (1)	57	6	32.2	6.01
Cambridge (2)	58	7	33.3	6.64
Chestnut Hill	58	6	33.0	6.50
Clinton	.....	.....	.....	5.03
Cotuit	50	13	33.8	4.22
Deerfield (1)	56	— 1	29.5	*4.01
Deerfield (2)	55	— 2	29.7	.....
Dudley	56	2	29.6	2.75
Fall River (1)	55	10	35.4	8.45
Fall River (2)	53	7	34.4	7.64
Framingham	58	5	32.0	5.39
Fiskdale	.....	.....	.....	3.53
Fitchburg (1)	55	2	29.9	5.73
Fitchburg (2)	55	3	30.3	4.80
Fort Warren	57	9	34.9	3.83
Gilbertville	56	4	30.3	4.73
Groton	58	4	31.0	4.35
Heath†	52	— 2	26.9	.....
Holyoke	56	8	33.2	3.94
Lake Cochituate	58	2	32.0	5.46
Lawrence	56	7	31.4	5.21
Leicester	54	1	29.4	3.87
Leominster	.....	.....	.....	4.99
Long Plain	52	8	.....	7.42
Lowell (1)	56	6	31.0	5.04
Lowell (2)	56	4	31.1	.....
Ludlow	56	2	29.5	3.97
Lynn	55	7	33.2	6.43
Massachusetts—Con.				
Mansfield	54	6	31.6	6.21
Medford	.....	.....	.....	5.47
Middleborough	55	8	33.0	6.15
Milton †	58	8	33.7	6.90
Mystic Lake	.....	.....	.....	5.88
Mystic Station	.....	.....	.....	5.57
Nantucket	53	15	35.8	4.11
New Bedford (1)†	52	8	33.7	5.88
New Bedford (2)	52	6	34.0	5.79
Newburyport (1)	58	7	32.7	5.89
Newburyport (2)	.....	.....	.....	4.63
Northampton	55	6	30.8	4.46
North Billerica	59	1	32.6	5.10
Plymouth	56	14	35.8	4.96
Princeton	54	0	27.3	5.99
Provincetown	54	17	35.7	3.52
Randolph	.....	.....	.....	6.45
Rowe	52	— 3	26.0	4.85
Royalston †	58	10	35.0	5.58
Salem (1)	52	8	32.9	.....
Salem (2)	.....	.....	.....	5.23
Somerset †	58	6	34.2	6.30
South Hingham	.....	7	.....	7.43
Springfield	58	6	32.5	3.88
Springfield Armr'y	58	6	31.1	3.92
Taunton (1)	58	8	34.5	6.13
Taunton (2)	58	7	33.4	5.83
Taunton (3)	58	8	33.3	6.43
Waltham	.....	.....	.....	6.24
Warwick	55	0	28.2	.....
Wellesley	56	4	33.0	5.92
Westborough	58	6	33.4	5.38
Williamstown	53	4	26.1	2.96
Winchester	.....	.....	.....	5.13
Worcester (1)	57	5	30.2	5.64
Worcester (2)	61	0	32.1	.....
Michigan.				
Adrian	53	— 5	25.2	1.79
Albion	51	0	30.0	1.62
Allegan	.....	.....	.....	1.77
Alma	50	0	24.5	2.57
Arbela	.....	.....	.....	2.16
Atlantic	38	— 2	19.8	3.80
Bear Lake	45	2	27.9	3.62
Bell Branch	40	6	26.7	1.72
Benton Harbor	50	12	28.2	1.86
Benzonia	45	8	24.6	2.59
Berlin	55	1	27.5	2.39
Big Rapids	50	3	24.3	1.86
Birmingham	50	— 7	27.0	2.43
Bronson	52	8	27.1	1.13
Buchanan	53	3	27.6	3.01
Calumet	40	— 1	20.2	2.83
Cassopolis	52	6	28.5	2.05
Chase	48	— 2	23.3	1.51
Chelsea	50	7	28.2	1.97
Clinton	.....	.....	.....	2.23
Colon	49	8	26.2	1.65
Columbia	50	12	30.0	2.26
Concord	49	8	26.8	1.50
Corunna	52	4	25.9	.....
Deer Lake	46	— 4	26.1	2.25
East Saginaw	50	7	26.7	2.21
Eden	50	5	28.6	1.59
East Tawas	46	4	26.1	.....
Fitchburgh	.....	.....	.....	2.13
Fletcher	44	—10	25.0	1.41
Flint	49	— 4	25.9	1.41
Fort Brady	44	—13	21.0	2.19
Fort Mackinac	40	3	23.8	.....
Fort Wayne	.....	— 2	.....	1.96
Fremont	48	7	25.6	2.03
Gladwin	45	—11	22.4	2.18
Grand Rapids	48	9	29.0	3.46
Grape	.....	.....	.....	1.38
Gulliver Lake	41	— 7	22.1	3.17
Hanover	51	6	28.2	1.45
Harrisville	45	— 5	26.1	3.43
Hart	51	5	26.5	2.50
Hastings	53	9	28.8	1.62
Hayes	.....	.....	.....	1.00
Highland Station	48	4	26.5	1.60
Hillman	47	— 2	23.8	2.15
Hillsdale	.....	.....	.....	1.26
Hudson	52	— 5	27.3	1.89
Ionia	50	2	27.3	3.26
Jeddo	44	5	29.5	2.01
Kalamazoo	52	5	29.3	1.46
Kenockee	.....	.....	.....	2.05
Lansing	50	4	28.8	1.67
Lathrop	48	—10	19.0	1.74
Madison	50	0	25.5	1.97
Manchester	.....	.....	.....	1.46
Marshall †	50	9	30.2	1.93
May	45	6	25.2	1.94
Mio	46	— 6	22.3	2.12
Montague	49	9	27.2	2.14
Mottville	53	— 9	27.9	1.05
North Aurelius	.....	.....	.....	2.63
Noble	.....	.....	.....	1.47
North Marshall	50	3	29.0	1.46
Olivet	52	3	27.4	1.44
Omer	46	— 8	24.7	1.60
Ovid	50	4	25.6	1.77
Paw Paw	54	8	27.1	1.53

Meterological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Michigan—Cont'd.	°	°	°	*Ins.*
Petersburgh	55	6	27.6	2.71
Pontiac	52	10	29.6	1.79
Pulaski	51	10	28.4	1.09
Romeo	47	8	26.8	.....
Roscommon	46	— 8	23.1	2.46
Saint John's	49	8	27.2	1.88
Saint Louis	50	4	25.8	2.96
Sand Beach	44	8	27.6	.....
Stockbridge	.....	.....	.....	1.61
Swarts Creek	51	— 4	27.6	2.05
Thornville	49	— 6	29.0	2.51
Traverse City (1)	46	1	27.0	2.67
Traverse City (2)	47	5	26.5	2.64
Vandalia	46	2	26.3	1.30
Vienna	.....	.....	.....	2.95
Washington	50	— 8	24.8	2.12
Weldon Creek	.....	.....	.....	2.88
West Branch	44	— 4	22.4	4.00
Williamston	52	7	30.6	2.15
Ypsilanti (1)†	46	— 4	29.6	2.23
Ypsilanti (2)	53	4	27.4	1.83
Minnesota.				
Alexandria*	.....	.....	.....	0.93
Farmington	40	—10	19.2	0.92
Fergus Falls*	.....	.....	.....	1.12
Fort Ripley *	.....	.....	.....	0.52
Fort Snelling	43	—11	18.3	0.63
Grand Meadow	41	— 8	19 0	0.53
L. Winnibigoshish	39	—28	11.6	1.32
Leech Lake	40	.....	.....	0.97
Le Sueur	39	—10	19.8	.....
Mankato	44	— 8	19.8	1.03
Medford	48	—14	17.6	0.83
Minneapolis (1)	40	—12	18.1	1.04
Minneaplois (2)	42	—12	20.2	0.69
Morris	40	—30	11.9	0.93
Northfield	41	— 8	19.5	0.92
Ortonville *	.....	.....	.....	0.20
Pine River	43	—34	12.2	0.92
Pokegama Falls	47	—33	11.2	1.34
Red Wing	46	— 6	20.4	0.80
Redwood Falls*	.....	.....	.....	0.83
Rochester	42	— 5	19.3	1.12
Rolling Green	38	—15	15.5	0.92
Saint Cloud	40	—19	16.6	.....
Tracy *	.....	.....	.....	0.56
Mississippi.				
Agricultural Col	65†	22	45.2	6.17
Batesville	68	21	45.5	4.11
Canton	.....	28	.....	4.21
Kosciusko *	.....	.....	.....	5.99
Lamar	66	22	44.8	.....
Loch Leven	68	28	49.5	5.14
Logtown	66	32	52.2	6.20
Louisville †*	65	22	44.4	4.75
Macon *(e)	62	23	41.2	5.80
Pearlington *†	71	32	.....	5.84
Palo Alto *	64	24	44.3	5.38
Pontotoc * †	59	23	42.1	7.82
Summit *	65†	24†	47.2†	5.13
Water Valley	.....	.....	.....	4.64
Waynesborough	64	24	.....	4.59
Yazoo City *.	.....	.....	.....	4.51
Missouri.				
Carthage	.....	.....	.....	3.44
Conception	53	— 1	25.0	1.06
Craig	47	0	27.9	3.10
Excelsior Springs†	48	4.	25.6	1.70
Fayette *	56	2	31.8	1.87
Fox Creek	60	11	33.7	3.35
Frankford †	.....	— 2	.....	2.03
Glasgow	55	2	30.2	1.89
Grand Pass	49	4	29.4	1.61
Hannibal	48	6	.....	.....
Harrisonville	48	2	28.8	1.81
Hermann *	.....	.....	.....	2.97
Ironton	69	16	39.5	3.40
Jefferson Barracks	58	5	29.0	2.52
Kirksville	50	2	28.4	1.02
Lakenan †	50	4	25.7	0.50
Lamonte	60	5	32.3	2.29
Langdon	.....	.....	.....	1.10
Macon City	45	7	30.0	1.50
Maryville	39	0	24.4	1.50
Mexico	45	6	.....	2.03
Mound City	48	0	25.9	1.68
Miami	55	3	30.7	1.60
New Frankfort†	50	4	29.9	.....
New Haven	60	23	40.7	3.00
Oak Ridge	58	18	37.0	2.50
Oakwood	.....	.....	.....	2.13
Oregon	49	0	26.9	1.53
Ozark †	55	8	34.4	3.20
Princeton	48	1	27.9	1.30
Saint Charles (1)	.....	.....	.....	2.80
Saint Charles (2)	62	11	34.1	2.63
Savannah	.....	.....	.....	1.00
Sedalia	58	1	35.6	1.98
Shelbina	.....	.....	.....	1.62
Steelville	63	12	.....	3.82
Troy	60	10	33.1	2.37
Warrensburgh	50	2	28.5	1.80
Wither's Mill	40	.....	.....	1.77
Montana.				
Custer *	.....	.....	.....	0.04

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Montana—Cont'd.	°	°	°	*Ins.*
Camp Poplar River	44	—20	9.8	1.58
Fort Custer	48	—12	16.0	0.20
Fort Assiniboine	51	—21	14.8	0.26
Fort Keogh	43	—18	14.0	0.46
Fort Maginnis	59	—15	20.0	1.13
Fort Missoula	44	—21	13.0	0.03
Fort Shaw	56	—22	24.2	0.38
Galpin *	.....	.....	.....	0.13
Sheldon †	41	—17	19.4	3.15
Virginia City *	43	— 8	18.4	0.06
Nebraska.				
Ansley *	52†	— 5	23.6	0.30
Ashland	46	— 3	.....	1.34
Creighton*	45	—15	18.5	1.75
Culbertson † (1)	56	—16	23.4	0.50
Culbertson * (2)	.....	.....	.....	0.75
David City	48	0	21.2	.....
De Soto	44	— 4	22.6	1.18
Fairbury	.....	0	.....	1.51
Falls City	46*	— 4*	26.2	1.51
Franklin	58	— 4	20.0	1.60
Fort Niobrara	50	—14	15.4	0.30
Fort Omaha	.....	.....	.....	0.37
Fort Robinson	55	1	26.2	0.08
Fort Sidney	55	— 4	22.7	0.24
Fremont	46	— 4	21.9	0.56
Genoa *	48	— 7	22.3	1.12
Hay Springs	49	— 5	20.7	0.46
Lincoln	49	— 4	25.6	1.28
Marquette †	50	— 5	.....	0.84
Minden	48	— 4	21.1	1.37
Nebraska City	49	— 3	23.6	1.30
North Loup *	44†	— 9	22.5	0.93
Oakdale	46	—13	19.6	0.88
Palmer	46	— 6	20.5	1.70
Ravenna	46	— 5	.....	1.02
Red Willow	.....	.....	.....	1.00
Sargent	42	—13	21.0	1.00
Syracuse†	45	2	24.9	1.15
Tecumseh *	45	— 4	20.0	1.90
Weeping Water †	46	— 6	23.4	1.72
West Hill	45	—10	20.4	0.75
West Point	45	—10	.....	0.90
Nevada.				
Austin	40	3	24.2	0.60
Battle Mountain †	48	— 6	19.5	?
Beowawe †	50	—19	16.6	?
Brown's †	48	0	26.7	?
Burner's Ranch	.....	.....	.....	?0.33
Carson City	57	— 7	28.7	0.10
Crane's Ranch	.....	.....	.....	0.62
Dayton	56	4	28.2	0.20
El Dorado	65	34	48.5	0.80
Elko	53	—22	17.6	0.70
Ely (f)	60	—15	22.3	1.01
Eureka	45	—11	19.9	0.86
Fort McDermitt	52	4	25.7	0.15
Genoa	53	0	30.2	0.76
Golconda † (1)	60	—10	26.9	?
Golconda (2)	.....	.....	26.2	0.25
Hot Springs †	60	2	23.6	?
Humboldt †	50	— 3	24.4	?
Lewer's Ranch †	58	5	29.2	0.40
Mill City †	.....	.....	23.5	.....
Montello †	38	—10	12.6	?
Palisade †	.....	.....	18.1	0.40
Reno † (1)	52	8	30.7	?
Reno (2)	53	0	28.5	0.37
Pioche †	56	— 6	24.1	1.10
Rioville †	68	28	45.5	1.14
Tecoma †	45	—10	15.2	?
Toano †	40	— 8	14.7	?
Tuscarora †	42	—10	20.2	2.54
Verdet	.....	.....	27.7	0.10
Wellington	49	6	26.9	0.27
Wells †	52	—20	11.8	?
Winnemucca	49	—14	21.8	0.32
New Hampshire.				
Antrim	.....	.....	.....	5.20
Belmont	.....	.....	.....	4.43
Berlin Falls	60	— 9	24.6	4.34
Berlin Mills	60	— 9	24.6	4.88
Bristol	.....	.....	.....	5.89
Concord	56	— 3	29.2	3.81
Hanover	50	— 7	25.4	3.26
Lake Village	.....	.....	.....	5.42
Manchester (1)	56	1	29.9	3.48
Manchester (2)	55	— 1	29.6	3.24
Mine Falls	.....	.....	.....	3.45
North Conway	.....	— 3	.....	5.10
Nashua	59	1	30.2	3.42
North Chesterfield	51	— 9	23.7	5.43
Pennichuck Sta	.....	.....	.....	3.30
Plymouth	45	— 7	24.3	4.29
Shaker Village	52	0	27.9	4.07
Stratford	60	—14	25.6	1.77
Walpole	52	— 4	26.0	3.45
West Milan	54	—12	22.1	3.12
Weir's Bridge	.....	.....	.....	4.24
Wolfborough	.....	.....	.....	5.76
New Jersey.				
Asbury Park	56	16	36.2	6.94
Beverly *	59	17	35.6	4.58
Billingsport L. H.	60	24	37.6	.....
Bridgeton	59	22	39.3	4.03

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
New Jersey—Cont'd.	°	°	°	*Ins.*
Cape May C. H.	58	21	40.8	.....
Clayton	58	20	38.0	*4.23
Egg Harbor City	58	17	36.1	5.88
Freehold	58	16	35.7	8.30
Gillette	58	9	34.0	3.99
Hanover	57	9	33.8	6.54
Highland Park	59	15	36.1	6.42
Hopewell	.....	.....	.....	3.84
Imlaystown	57	17	35.8	6.82
Jersey City	58	1	33.9	.....
Lambertville	56	18	36.5	4.55
Locktown	57	13	33.9	4.60
Madison	58	12	33.6	6.98
Moorestown†	58	19	35.5	4.07
New Brunswick (1)	58	18	.....	6.43
New Brunswick (2)	59	15	38.3	6.86
New Brunswick (3)	58	15	35.3	.....
Newark	56	17	35.6	6.04
Ocean City	52	29	38.6	6.50
Oceanic	58	20	39.3	8.78
Paterson	65	14	36.6	.....
Plainfield	58	13	34.3	8.37
Princeton	58	16	35.3	4.40
Rancocas	59	18	34.5	4.40
Readington†	58	16	38.8	.....
Somerville	59	16	35.6	5.54
South Orange	58	14	33.6	7.15
Tenafly	67	8	32.8	5.34
Tom's River	56	16	36.1	7.38
Trenton	60	18	38.0	4.40
Union	56	15	33.6	44.1
Vineland	57	18	37.0	4.38
New Mexico.				
Coolidge *h*	45	—12	18.6	0.60?
Deming†	60	22	39.6	0.69
Embudo†	48	— 3	22.4	1.13
Fort Bayard	70	6	37.8	0.50
Fort Union	58	—10	15.5	1.20
Fort Wingate	48	— 7	24.2	1.15
Gallinas Spring*	52	8	33.2	1.15
Las Vegas *	54	—11	24.0	1.19
Lordsburg†	61	20	39.2	0.57
Springer *	.....	.....	.....	0.65
New York.				
Angelica*	49	— 2	27.8	3.10
Ardenia†	62	14	34.5	4.15
Auburn	54	2	31.2	4.21
Barnes' Corners*†	50	—10	22.1	4.35
Boyd's Corners†	55	10	33.2	5.14
Constableville*†	45	— 4	22.9	4.05
Canton*	48	— 5	23.7	6.13
Cooperstown†	54	4	27.0	2.22
David's Island	52	11	33.6	6.12
Eden†	45	10	31.2	5.16
Elmira*	51	6	31.6	9.80?
Factoryville*	57	— 2	29.7	2.35
Fleming†	.....	2	.....	.....
Fort Columbus	55	17	36.4	4.92
Fort Hamilton	54	17	37.0	5.00
Fort Niagara	48	10	31.7	2.88
Fort Porter	50	4	28.5	5.00
Fort Schuyler	54	16	37.5	2.44
Fort Wadsworth	56	16	35.9	6.23
Friendship	48	4	27.8	4.25
Geneva	50†	8	30.2	3.53
Hess Road Sta*†	50	9	30.7	9.50?
Humphrey †	47	5	27.8*	3.16
Ilion†*	58	5	28.0	3.69
Ithaca	58	0	29.8	3.19
Kingston *b*	55	1	29.2	4.60
Le Roy	50	3	26.4	3.59
Lowville†	54	— 1	26.4	5.61?
Madison Barracks	51	— 9	28.1	2.42
Middleburgh*	61	— 9	30.0	4.45
Newfane Sta.†	.....	8	28.7	.....
Nineveh	52	— 8	24.8	.....
North Hammond*	50	— 2	27.4	2.64
North Volney	50	1	27.8	.....
Number Four*	50	— 8	23.0	7.09
Palermo	52*	— 6*	28.0	3.48
Potsdam†	45	— 6	24.5	3.42
Palmyra	48	6	29.9	.....
Pendleton Centre†	.....	6	26.8	.....
Penn Yan	54	6	30.2	3.29
Perry City†	49	1	27.6	4.65
Plattsburgh B'ks *	54	0	25.0	1.75
Queensbury†*	.....	—10	.....	4.72
Salem	59	— 1	23.8d	.....
Savona*	55	5	28.6	2.73
Saranac Lake *	46†	—12	24.0	5.43
Setauket	58	16	35.7	6.26
Somerset†	.....	8	26.9	?
South Canisteo†..	56	8	30.7	0.80
South Kortright*†	53	4	26.8	.....
Utica	60	6	28.3	6.17
Watervleit Arsenal	54	3	30.8	2.08
Wedgwood	58	2	29.0	3.53
West Point	60	8	31.3	5.08
White Plains†	56	10	35.6	4.32
Willet's Point	54	11	34.9	6.08
North Carolina.				
Asheville (1)	60	13	38.8	2.59
Asheville (2)*	.....	.....	.....	3.45
Chapel Hill	70	20	46.6	6.71
Charleston*	.....	.....	.....	4.77
N. Carolina—Cont'd.	°	°	°	*Ins.*
Hot Springs	60	17	41.1	.....
Lenoir†	60	14	38.1	3.50
Mount Holly*	.....	.....	.....	6.17
Mount Pleasant	69	17	41.0	6.06
Monroe	68	22	43.0	6.00
Murphy*	.....	.....	.....	6.01
New Berne	79	20	48.0	5.80
Salisbury	67	30	44.0	5.90
Statesville	64	20	40.0	4.90
Weldon*	68	17	43.0	4.67
Ohio.				
Akron	54	13	31.3	2.61
Ashland	.....	.....	.....	2.90
Athens	58	15	35.1	2.33
Bangorville	54	7	30.6	4.34
Bellevue †	54	12	30.8	2.59
Caledonia*	.....	.....	.....	3.26
Celina	58	13	33.6	2.90
Canton*	.....	.....	.....	3.42
Circleville*	.....	.....	.....	2.75
Cleveland	55	13	33.1	3.03
College Hill †	50	16	36.0	3.70
Collinwood†	45	16	31.4	2.47
Columbus Barracks	56	16	34.8	4.90
Dayton	56	13	34.9	3.28
Demos	56	18	35.7	3.04
Ellsworth	.....	.....	.....	3.11
Elyria	56	14	32.8	3.16
Fostoria	55	9	32.2	1.14
Gallipolis *	.....	.....	.....	2.92
Garrettsville	55	— 6	29.1	3.11
Georgetown	55	16	36.0	3.53
Gracey	.....	.....	34.2	1.90
Granville	54	11	32.2	2.48
Greenville	55	14	32.3	3.79
Hanging Rock	59	15	35.7	3.49
Hiram	54	7	30.7	2.71
Hudson	.....	.....	.....	1.74
Jacksonborough	52	12	33.2	2.60
Jefferson	55	9	29.7	4.06
Kenton*	46	15	33.0	2.60
Logan	56	13	34.9	3.66
Lordstown	52	3	31.1	3.20
Mansfield*	.....	.....	.....	4.15
Marietta (1)*	.....	.....	.....	3.29
Marietta (2)	59	17	36.7	3.28
McConnelsville	56	10	35.3	3.43
Napoleon*	56	11	34.0	2.12
New Alexandria	53	11	33.4	3.60
New Comerstown	54	11	32.2	4.06
North Lewisburgh	56	11	33.6	4.80
Oberlin	56	10	31.2	2.00
O. S. University	56	16	33.0	3.90
Ottawa	.....	.....	.....	1.94
Pomeroy	60	20	38.6	2.05
Portsmouth (1)*	.....	.....	.....	4.08
Portsmouth (2)	61	21	37.8	4.07
Quaker City	55	13	35.4	3.66
Ruggles †	46	12	31.6	3.15
Sidney	55	11	33.0	3.59
Springborough	.....	.....	.....	3.48
Tiffin †	54	12	32.2	2.85
Upper Sandusky	56	14	33.0	3.27
Wapakoneta	54	12	31.3	0.64
Wauseon	55	1	29.4	2.17
Waynesville	.....	.....	.....	3.69
Westerville	54	15	32.5	3.67
West Milton	59	12	36.6	5.78
Weymouth	.....	.....	.....	2.86
Wooster (1)*	.....	.....	.....	3.73
Wooster (2)	54	12	31.1	4.33
Yellow Springs	.....	10	33.3	3.83
Youngstown	55	3	32.9	3.39
Zanesville *	.....	.....	.....	3.25
Oregon.				
Albany*	56	22	40.0	3.96
Ashland†	59	24	42.7	?
Bandon †	64	32	45.9	6.76
East Portland	50	23	.....	4.10
Eola †	50	20	38.0	3.08
Fort Klamath	48	— 7	24.0	1.61
McMinnville*	54	19	38.5	4.52
Mount Angel *	54	22	38.7	3.50
Parkers*	.....	.....	.....	1.17
Siskiyou†	62	20	36.4	?
Tillamook*	70	32	49.9	8.75
Pennsylvania.				
Allegheny Arsenal	55	12	34.5	2.96
Altoona	59	14	37.1	1.82
Brookville*	.....	.....	.....	2.93
Blooming Grove	56	0	30.9	4.30
Carlisle	65	4	33.2	3.49
Catawissa	62	11	34.7	3.22
Charlesville	60	— 5	31.3	3.74
Clarion (1) *	.....	.....	.....	3.77
Clarion (2)	56	6	29.1	3.55
Coatesville	62	14	33.2	4.33
Columbus	50	4	29.2	3.22
Confluence*	.....	.....	.....	1.99
Corry	50	4	29.2	3.22
Coudersport	50	— 2	28.6	4.80
Drifton*	60	7	30.4	3.74
Eagle's Mere	50	— 1	26.6	4.92
East Brook†	50	10	30.1	.....
Easton†	.....	.....	.....	5.36

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Pennsylvania—Con.	°	°	°	*Ins.*
Emporium	56	— 3	30.5	2.75
Edinborough	46	12	28.4	.....
Frankford Arsenal	59	17	35.8	3.65
Franklin †	50	7	29.3	4.12
Freeport*	.....	.....	.....	2.86
Germantown	60	17	35.8	3.82
Girardville	51	10	32.7	3.80
Grampian Hills	52	6	28.8	3.22
Greensborough *	.....	.....	.....	2.47
Greenville	55	9	28.7	3.52
Hollidaysburgh	61	— 2	32.0	2.56
Honesdale	54	— 3	27.8	4.15
Huntingdon	61	— 2	32.5	2.84
Indiana	59	8	34.9	2.94
Johnstown*	.....	.....	.....	3.11
Lancaster	64	14	34.9	2.83
Lebanon	62	12	33.0	4.26
Le Roy †	53	5	28.0	1.59
Lock Haven	57	0	32.0	3.46
Lock No. 4*	.....	.....	.....	2.61
Meadville (1)*	46	.....	.....	3.20
Meadville (2)	56	12	30.1	4.25
Mahoning*	.....	.....	.....	3.26
McConnellsburgh	64	2	33.6	3.53
New Bloomfield	64	0	31.7	3.52
New Castle	56	— 2	33.2	3.17
Oil City*	.....	.....	.....	1.81
Parkers Landing*	.....	.....	.....	3.07
Philipsburgh*	56	— 1	28.6	2.41
Pottstown	58	16	35.0	4.12
Quakertown	59	7	32.4	4.58
Reading*	64	7	33.2	3.74
Rimersburgh	50	12	30.0	.....
Salem Corners†	52	7	28.1	3.87
Saltsburgh*	.....	.....	.....	2.39
Selin's Grove	55	8	33.3	4.00
Smethport	52	— 2	30.0	.....
Somerset	54	8	30.7	3.48
State College	57	10	30.6	1.97
Swarthmore	56	18	35.7	4.80
Tionesta	54	4	29.5	3.50
Troy†	57	0	30.3	2.98
Uniontown	62	13	36.5	2.34
Warren*	.....	.....	.....	2.77
Wellsborough	58	— 2	30.0	8.20
West Chester	58	16	35.2	4.78
Westtown	68	20	35.8	3.51
Wysox	59	0	30.0	2.70
Rhode Island.				
Bristol	55	9	35.2	5.82
Fort Adams	.....	9	.....	3.74
Kingston	.....	.....	.....	8.27
Lonsdale	.....	.....	.....	5.92
Newport	53	13	36.2	.....
Olneyville	63	10	37.4	.....
Pawtucket	.....	.....	.....	5.72
Providence (1)	58	11	35.5	5.62
Providence (2)	55	8	33.6	4.91
Woonsocket	56	8	32.1	5.61
South Carolina.				
Aiken	70	26	47.2	8.79
Brewer Mine	68	19	49.0	7.10
Cedar Springs*	78	22	40.8	6.81
Clinton	68	23	45.0	4.64
Columbia (Ex.Sta.)	70	24	46.1	5.74
Conway †	70	29	49.5k	5.67
Evergreen	67	18	49.0	6.23
Florence	65	30	35.0	.....
Kirkwood †	.....	18	42.3	5.03
Newberry	68	24	44.0	6.92
Spartanburgh	67	15	52.0	3.35
Statesburgh *	65	26	46.8	4.91
Timmonsville	69	30	39.0	3.86
Trial	.....	.....	.....	7.18
Winnsborough	68	19	49.0	4.14
Yorkville	77	20	57.0	6.58
Tennessee.				
Ashwood*†	58	21	41.2	5.30
Austin*	61	22	40.4	4.62
Columbia*	.....	.....	.....	2.16
Covington	62	21	41.7	5.07
Clarksville	60	19	39.3	2.90
Fayetteville	62	20	42.3	4.44
Florence Station	58	24	40.9	4.60
Fostoria	70	13	40.2	3.50
Greeneville	61	18	38.5	3.40
Hohenwald	63	18	39.9	4.22
Jacksborough	60	18	39.0	4.44
Johnsonville*	.....	.....	.....	3.02
Kingston Springs	65	17	40.0	3.95
Kingston *	.....	.....	.....	5.29
Lawrenceburgh	57	16	38.3	5.69
Leeville	63	20	40.6	4.45
Lewisburgh	57	19	38.2	4.82
Lookout Mountain	54	15	39.7	4.28
McKenzie	64	21	42.2	3.55
Milan	65	20	39.5	4.82
Nunnelly	64	19	40.7	3.51
Parksville	60	19	43.7	5.08
Riddleton	70	20	40.5	4.01
Rogersville	60	20	38.7	3.30
Rockwood *	.....	.....	.....	4.56
Savannah	64	26	43.2	3.83
Springdale	65	18	38.8	3.89
Strawberry Plains*†	.....	.....	.....	0.92
Tennessee—Cont'd.	°	°	°	*Ins.*
Trenton	62	20	39.1	5.25
Watkins	59	21	39.1	3.72
Waynesborough	82?	21	40.8	4.62
Texas.				
Austin	75	26	49.8	8.02
Baird	.....	.....	.....	2.93
Belton*	74	25	44.0	5.53
Brownwood *	74	24	44.9	3.09
Brady *	76	22	44.1	2.87
Brazoria*	70†	30	52.6	10.04
Cedar Hill †	69	19	48.2	9.20
Brenham*	73	31	52.4	8.56
Camp Eagle Pass	88	20	52.5	4.85
Cleburne	70	20	45.7	5.40
C'mp Pena Colorado	56	9	34.0	1.95
College Station	68	28	48.4	7.07
Columbia Station*	72	32	53.3	7.33
Comanche†	72	27	46.0	5.25
Corsicana (1)	75	24	57.7	8.73
Corsicana (2)	.....	.....	.....	6.91
Decatur *	75	16	43.5	4.69
Edinburgh*	.....	.....	.....	4.14
Fort Bliss	67	20	40.8	0.74
Fort Brown *o*	76	35	57.1	1.91
Fort Clark	70	11	44.5	0.72
Fort Concho	75	21	46.3	1.94
Fort Davis	62	11	39.2	0.39
Fort Elliott	61	4	34.4	1.64
Fort Hancock	77	10	41.4	0.62
Fort McIntosh	.....	28	.....	1.98
Fort Ringgold	92	25	57.5	2.04
Fort Worth*	.....	22	45.6	5.03
Gallinas*	82	22	50.7	4.94
Granbury*†	75	24	47.0	4.61
Houston	70	27	51.2	9.45
Huntsville*	69	26	49.8	7.49
Ingersol *	.....	22	41.8	7.35
La Grange*	.....	27	51.7	7.57
Lampasas*	76	22	46.8	5.08
Longview*	68	24	48.2	6.55
Luling *	76	28	51.1	4.76
Mesquite *	74	18	45.7	8.49
Mexia *	76	26	48.0	9.03
New Ulm	70	30	51.4	8.38
New Braunfels*	78†	25	51.4	6.00
Silver Falls *	64	11	38.4	1.25
San Antonio	80	29	51.6	4.96
Tyler*	67	22	47.2	13.85
Waco *	75	28	48.1	9.50
Utah.				
Corinne†	46	— 4	18.9	.....
Fort Douglas	41	5	21.0	0.82
Fort DuChesne	38	—22	6.5	0.35
Kelton†	45	—12	17.9	?
Ogden†	44	— 4	19.5	?
Price*	.....	.....	.....	0.30
Promontory †	42	— 2	26.6	?
Terrace†	39	—10	18.1	?
Vermont.				
Brattleborough (1)	54	— 3	29.0	5.30
Brattleborough (2)	54	1	28.8	.....
Burlington	56	0	26.8	3.57
Cornwall	.....	.....	.....	3.59
Chelsea	44	— 8	24.1	4.11
Coventry	49†	—10	22.9	3.05
East Berkshire*	54	—15	22.5	3.43
Jacksonville	52	— 2	25.8	5.96
Lunenburgh	58	0	28.0	3.53
Manchester	54	2	28.3	4.23
Middlebury	50	— 2	24.6	3.97
Saint Johnsbury	52	—14	21.7	.....
Saxton's River	52	—11	26.1	4.42
Strafford †	50	— 4	25.4	4.80
Vernon	52	— 6	29.3	4.97
Virginia.				
Abingdon*	.....	.....	.....	2.96
Bird's Nest†	64	24	41.2	5.85
Christiansburgh *	57	14	37.1	4.11
Dale Enterprise *	65	10	41.4	4.04
Fort Monroe	64	23	41.4	4.26
Fort Myer	65	18	37.7	1.77
Marion *	60	10	34.8	2.77
Petersburgh*	65	21	40.0	3.71
Smithville	68	21	43.2	3.77
Spottsville	66	20	41.8	3.66
University of Va	.....	.....	.....	4.42
Wytheville	58	18	36.0	3.05
Washington Territory				
Blakeley*†	50	25	38.0	2.57
Fort Spokane	40	— 8	22.5	1.90
Fort Townsend	51	25	38.3	1.02
Fort Walla Walla	49	8	29.3	0.04
Tacoma†	47	21	37.8	4.41
Vancouver B'ks	55	19	38.4	3.89
West Virginia.				
Buckhannon*	.....	.....	.....	3.10
Charleston	.....	.....	.....	3.53
Clarksburgh	60	8	32.10	2.70
Glenville*	.....	.....	.....	3.42
Helvetia	58	6	35.2	2.95
Hinton*	.....	.....	.....	2.07
Middlebrook	50	8	30.6	2.30
Morgantown*	.....	.....	.....	2.75
Parkersburgh*	58	17	36.0	2.60
Rowlesburgh	.....	.....	.....	2.71

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
West Virginia—Con.	°	°	°	*Ins.*
Rockport	60	17	35.2	3.04
Tyler Creek †	67	20	35.8	.....
Wheeling*	.....	.....	.....	2.87
White Sulph. Sp'gs*	.....	.....	.....	3.03
Weston*	.....	.....	.....	3.99
Wisconsin.				
Chippewa Falls*	.....	.....	.....	1.41
Cadiz †	.....	—10	.....	.....
Delevan	46	— 8	23.6	2.07
Embarrass†	44	—10	21.1	3.50
Fond du Lac	43	— 5	23.8	2.34
Fredonia	43	— 2	22.8	.....
Lincoln	.....	8	21.8	.....
Madison	42	— 2	22.6	1.59
Manitowoc	45	3	27.0	2.68
Oshkosh*	43	— 4	19.6	2.89
Phillips*	.....	.....	.....	1.73
Portage*	.....	.....	.....	1.72
Rhinelander	.....	.....	.....	0.12
Waucousta	.....	— 3	19.0a	.....
Weston	.....	—10	17.0	2.62
Wyoming.				
Camp Sheridan	38	— 7	14.7	1.05
Camp Pilot Butte	35	—30	13.8	0.16
Carter*	.....	.....	.....	0.80
Fort Bridger	40	—24	13.9	1.53
Fort D. A. Russell	53	— 5	21.7	.....
Fort Laramie	54	— 8g	23.6	0.15
Fort McKinney	47	2	25.0	0.30
Fort Washakie	43	—19	8.7	0.76
Sweetwater Bridge*	.....	.....	47.7	0.78
Mexico.				
Guanajuato	74	39	55.2	1.27
Leon	75	38	57.4	0.66
Topo Chico	77	53	60.8	0.74
Zacatecas	77	23	47.7	2 69
West Indies.				
Grand Turk	82	75	79.6	0.31
Hamilton, Bermuda	70	54	63.9	5.53
Port au Prince	90	64	70.1	0.51
LATE REPORTS.				
Alaska.				
Killisnoo	52	21	35.9	4.45
Alabama.				
Valley Head	63	15	40.0	5.82
Arizona.				
Lochiel	.....	.....	.....	1.90
Maricopa †	80	30	51.2	0.85
Texas Hill †	61	30	44.6	2.65
Yuma †	70	41	52.1	1.13
Arkansas.				
Madison	.....	.....	.....	0.55
California.				
Anderson	69	28	47.8	0.44
Beaumont †	68	32	47.9	1.15
California—Cont'd.				
Bishop Creek †	62	13	37.3	?
Caliente †	66	28	47.8	0.59
Chico †	66	31	45.3	0.34
Cisco †	45	16	31.6	?
Colton †	84	26	48.4	0.86
Edgewood †	50	7	33.1	?
Fort Gaston †	54	19	37.2	8.57
Fresno †	96	29	51.1	0.37
Galt †	57	28	44.8	0.20
India †	78	30	53.3	0.57
Keeler †	54	27	40.3	0.04
Kingsburgh †	60	30	42.8	0.29
Lewis Creek †	60	33	45.3	1.00
Livermore †	74	30	45.6	0.46
Los Gatos †	62	29	47.7	0.66
Merced †	68	32	45.0	0.43
Modesto †	65	30	44.6	0.32
Mojave †	91	26	49.9	0.35
Newhall †	70	26	48.0	0.35
Nicolaus †	74	29	46.7	0.14
Orland †	70	34	48.9	0.22
Petaluma †	66	30	46.6	0.71
Pleasanton †	76	24	47.1	0.60
Porterville †	61	30	44.6	0.82
San Bernadino	76	33	52.8	0.93
San Fernando †	66	30	48.5	0.09
San Pedro †	66	40	53.5	0.75
Spadra †	71	32	44.6	0.15
Summit †	40	8	25.3	?
Willow †	54	31	42.9	0.54
Dakota.				
Wolsey	40	—31	11.0	1.85
Florida.				
Homeland	81	35	64.8	7.45
Georgia.				
Andersonville †	.....	22	.....	9.27
Indiana.				
Laconia †	56	17	35.2	3.20
Iowa.				
Ames	44	— 6	20.7	1.80
Oskaloosa †	50	— 4	24.8	1.12
Clear Lake	46	— 7	18.9	2.10
Mexico.				
La Logia †	82	37	.....	1.94
Mexico	74	38	56.6	0.09
Topolobampo †	74	57	.....	1.30
Masatlan	76	57	65.5	4.15
Maryland.				
Fallston	59	20	35.8	5.40
Missouri.				
Pierce City †	60	3	35.7	2.10
Nebraska.				
Kimball	54	— 3	24.2	?
Nevada.				
Carlin †	35	—24	10.7	?
Elko †	46	—18	16.8	?
Fenelon †	32	— 6	14.3	?
Nevada—Cont'd.				
Halleck †	44	—20	15.2	?
Hawthorne	54	10	33.6	?
Hot Springs	60	2	23.6	0.00
Palisade	45	—22	13.7	?
Winnemucca	47	—16	21.9	?
New Mexico.				
Fort Seldon	68	20	42.7	1.32
New York.				
Brooklyn	61	18	40.9	6.58
Lyons	54	4	30.1	2.02
Pennsylvania.				
Dyberry	57	— 6	27.1	3.60
Texas.				
Santa Maria	.....	.....	.....	4.11
Victoria †	74	34	54.7	10.05
Utah.				
Blue Creek †	36	5	19.5	?
Virginia.				
Summit	64	12	36.0	.....
Washington Territory				
Vashon	52	26	38.1	0.90

Meteorological record of voluntary observers, &c.—Continued.

Reports received too late for publication in the December Weather Review.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Alaska.	°	°	°	*Ins.*
Killisnoo	49	28	35.9	3.85
Arizona.				
Bangharts	.....	.....	.....	3.02
Globe	64	.....	.....	2.18
Maricopa †	81	39	56.3	0.70
Willow Springs	.....	.....	.....	3.08
Wilcox †	69	36	51.6	1.17
Yuma †	70	42	55.3	0.49
California.				
Almaden †	65	43	54.7	3.72
Anderson d	69	33	51.8	8.70
Boca †	48	10	31.2	0.50
Caliente †	68	30	52.9	2.18
Chico †	64	35	51.4	5.35
Cisco †	43	20	35.7	3.88
Edgewood †	57	24	40.5	0.75
Galt †	57	36	49.6	3.14
Hydesville	65	35	51.0	4.98
Livermore †	64	30	47.6	2.21
Los Gatos †	64	38	52.4	3.28
Marysville †	60	40	47.7	6.27
Modesto †	62	37	50.4	1.40
Needles	68	32	51.2	1.98
Orland †	65	42	51.1	3.47
Pleasanton †	63	36	51.6	1.85
Selma †	60	35	48.0	1.88
Suisun †	71	39	54.1	4.48
Tehama †	70	35	55.0	8.33
Vina †	60	39	50.8	5.16
Willow †	56	37	47.6	3.61
Connecticut.				
Southington	57	4	30.8	6.13
Illinois.				
Jacksonville	55	17h	34.7d	2.64
Indiana.				
Mount Vernon	58	20	31.2	2.09
Iowa.				
Clear Lake	56	5	25.8	0.65
Mount Pleasant †	50	14	31.2	2.60
Wesley	56	1	24.2	1.25
Kansas.				
Emporia	67	16†	36.3	3.00
Louisiana.				
Luling	73	24	48.9e	3.54
Mississippi.				
Biloxi j	63	28	50.2	.....
Mexico.				
La Logia †	88	50	.....	1.19
Mazatlan	84	64	73.6	0.19
New York.				
Brooklyn j	59	12	37.8	.....
North Carolina.				
Raleigh	68	21	44.0	3.23
Texas.				
Colorado	.....	.....	.....	1.46
Miami	.....	.....	.....	0.09
Snyder †	.....	31	.....	0.62
Utah.				
Terrace	55	10	37.0	?
Promontory	42	0	26.7	2.10
Nevada.				
Fenelon †	44	— 2	26.5	?
Wadsworth †	50	16	33.7	?
Winnemucca †	72	11	38.5	0.10
Carson City	61	18	36.6	0.61
West Virginia.				
Parkersburgh	54	13	34.3	1.52
Rockport	64	13	34.3	1.64
West Indies.				
Grand Turk Isl'd ‡	.....	.....	79.9	5.17
Washington.				
Vashon	54	26	41.8	4.65

† Maximum and minimum from observed readings. The letters of the alphabet denote number of days missing in record. ‡ Mean temperature from one observation taken at 10 a. m.

Data from Canadian stations for January, 1889.

Station.	Pressure not reduced to sea-level. 8 a. m.	3 p. m.	8 p. m.	Mean actual pressure, 8+3+2.	Mean reduced pressure.	Temperature. 8 a. m.	3 p. m.	8 p. m.	Mean temperature, 8+3+2.	Total precipitation.	Departure from normal precipitation.	Wind. Number of times observed. N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
Saint John's, Newfoundland	29.58	29.59	29.60	29.59	29.77	28.1	28.7	27.5	27.8	5.91	.....	2	8	0	4	16	15	16	32	0
Sydney	29.88	29.87	29.89	29.88	29.94	26.4	28.3	25.8	26.1	3.34	—1.47	3	3	6	6	8	22	25	12	8
Halifax	29.87	29.83	29.86	29.86	30.00	26.9	32.7	28.8	27.8	4.39	—1.30	5	2	2	10	3	16	14	39	2
Grand Manan	29.93	29.88	29.91	29.92	29.97	28.4	31.7	29.3	28.8	2.72	—2.65	9	9	4	5	9	20	21	13	3
Saint Andrews	29.92	29.87	29.90	29.91	29.96	24.5	28.8	26.4	25.4	4.08	+0.78	5	6	10	1	8	5	7	39	12
Charlottetown	29.91	29.90	29.90	29.90	29.94	23.2	26.3	23.8	23.5	1.10	—2.31	22	1	11	8	8	4	27	9	3
Chatham	29.93	29.91	29.93	29.93	29.99	14.8	23.0	18.5	16.6	2.57	—0.71	4	4	7	0	1	4	23	13	37
Father Point	29.95	29.91	29.91	29.93	29.96	14.0	17.3	16.2	15.1	3.90	+1.20	13	19	1	2	5	22	9	17	5
Quebec	29.65	29.61	29.62	29.64	29.99	15.7	19.8	18.4	17.0	6.15	+2.48	10	19	4	0	9	11	22	0	18
Montreal	29.78	29.74	29.75	29.76	29.98	18.9	22.3	21.1	20.0	4.67	+1.39	8	17	5	5	4	25	19	7	3
Rockliffe	29.90	29.43	29.44	29.47	29.96	14.0	22.4	18.6	16.3	1.85	—0.16	1	0	1	8	0	0	0	22	61
Kingston	29.63	29.60	29.62	29.62	29.97	24.5	28.3	26.4	25.4	5.95	+2.69	7	23	3	4	7	27	16	5	2
Toronto	29.60	29.57	29.59	29.60	30.00	25.5	31.2	28.3	26.9	3.46	+0.95	9	11	6	4	8	18	20	12	5
Port Stanley	29.35	29.35	29.37	29.36	30.03	25.2	32.0	28.1	26.8	4.05	+1.37	6	6	5	24	0	6	43	3	0
Saugeen	29.21	29.21	29.20	29.20	29.95	24.8	29.5	26.8	25.8	3.71	+0.25	6	14	8	9	17	12	13	13	1
Parry Sound	29.23	29.22	29.24	29.24	29.96	20.6	26.8	23.4	22.0	3.35	+0.20	9	15	15	3	5	3	20	10	7
Port Arthur	29.26	29.23	29.26	29.26	30.01	9.9	19.1	14.7	12.3	1.34	+0.53	6	8	2	0	7	4	24	14	34
Winnepeg	29.17	29.17	29.17	29.17	30.06	1.2	11.1	7.2	4.2	1.57	+0.91	20	0	1	3	34	5	5	14	8
Minnedosa	28.12	28.10	28.12	28.12	30.08	2.6	14.0	7.2	4.9	1.04	+0.35	6	1	2	4	0	5	38	22	15
Q'Appelle	27.68	27.69	27.68	27.68	30.10	5.5	12.1	10.4	8.0	0.10	—0.27	2	0	5	0	14	16	20	30	6
Medicine Hat	27.68	27.63	27.65	27.66	30.13	6.2	22.5	14.9	10.6	0.10	—0.20	0	2	0	0	0	16	9	4	62
Yarmouth	29.92	29.88	29.89	29.90	29.98	30.8	33.5	31.5	31.2	3.52	—1.70	4	10	8	9	6	13	6	35	2
Swift Current	27.33	.....	27.33	27.33	30.09	6.8	.....	11.2	9.0	0.65	.....	0	0	0	0	14	3	11	7	27
Calgarry	26.38	26.36	26.37	26.38	30.11	12.6	24.8	20.7	16.6	0.92	.....	10	1	1	2	0	3	30	13	33
Edmonton	27.57	27.56	27.56	27.56	30.01	13.8	28.2	24.3	19.0	0.05	.....	0	3	0	0	3	8	3	22	54
December, 1888.																				
Edmonton	27.52	27.52	27.53	27.52	29.97	14.8	27.4	23.6	19.2	.....	.....	0	0	0	3	3	13	5	11	58
Swift Current	27.29	27.29	27.29	27.29	30.00	18.1	26.9	21.2	19.6	0.38	.....	2	1	1	2	27	9	11	7	33
Saint John's, Newfoundland	29.44	29.42	29.43	29.44	29.62	29.9	31.4	29.5	29.7	9.08	.....	0	13	5	7	16	12	9	31	0

Table of miscellaneous meteorological data for January, 1889—Signal Service observations.

Stations and districts.	Elevation above sea-level, feet.	Pressure, in inches.			Temperature of air, in degrees Fahrenheit.							Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal precipitation.	Wind.				Cloudless days.	Partly cloudy days.	Cloudy days.	Days with rainfall.	Average cloudiness, tenths.		Temperature data since opening of station.			
		Mean actual.	Mean reduced.	Monthly range.	Monthly mean.	Departure from normal.	Maximum.	Mean maximum.	Minimum.	Mean minimum.	Greatest daily range.	Least daily range.					Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					8 a. m.	8 p. m.	Length of record, years.	Absolute maximum.	Year.	Absolute minimum.	Year.
New England.					33.5	+ 7.5								3.35	— 0.46															
Eastport	53	29.91	29.97	1.57	28.0	+ 8.0	45	34.9	— 2	21.1	32	4	19.0	73.0	3.44	— 0.67	9,776	nw.	63	se.	21	12	6	13	11	4.6	3.4	16	51	'74	—20	'74
Portland	99	29.87	29.98	1.52	29.1	+ 6.1	52	35.7	6	22.5	26	2	20.9	74.4	3.47	— 0.11	6,585	nw.	47	se.	21	5	10	16	11	5.7	4.5	18	58	'76	—15	'87
Northfield	871	29.01	30.00	1.52	23.7	.....	57	31.2	—10	16.2	36	3	17.9	82.5	3.90	.....	6,248	s.	48	sw.	10	4	10	17	17	7.3	5.7	2	57	'89	—24	'88
Manchester	247	29.73	30.00	1.51	29.9	.....	60	37.8	3	22.0	32	2	21.7	76.6	2.79	.....	4,885	nw.	32	se.	9	8	16	7	10	5.9	4.1	2	60	'89	—11	'88
Boston	135	29.87	30.01	1.52	25.8	+ 9.8	60	42.0	9	29.5	24	3	31.1	71.2	4.11	— 0.23	9,552	w.	54	se.	21	7	12	12	11	5.4	4.4	19	70	'76	—13	'82
Nantucket	14	30.00	30.01	1.45	37.7	.....	54	43.9	16	31.5	26	5	33.2	88.8	5.03	.....	8,839	nw.	42	se.	21	12	8	11	10	4.9	4.5	3	54	'87	— 4	'86
Wood's Holl	22	29.99	30.01	1.45	36.0	.....	56	41.5	14	30.5	29	2	30.4	83.9	3.91	+ 0.38	13,117	nw.	60	w.	10	12	10	9	11	4.2	4.1	12	56	'89	— 8	'82
Vineyard Haven	.....	.....	.....	.....	38.3	.....	58	46.0	13	30.6	25	8	.....	.....	3.11	.....	.....	nw.	.....	.....	.....	.....	.....	.....	13	.....	.....	3	60	'88	— 7	'88
Block Island	26	29.99	30.02	1.49	36.1	+ 5.1	56	40.9	10	31.3	21	4	30.8	80.4	2.16	— 3.16	13,813	nw.	70	e.	6	12	8	11	11	4.7	4.2	9	59	'85	— 4	'82
Narragansett Pier	22	.....	.....	.....	34.8	+ 6.8	55	42.6	11	27.1	28	6	.....	.....	6.52	+ 0.79	.....	w.	.....	.....	.....	.....	.....	.....	12	.....	.....	7	57	'85	— 5	'88
New Haven	107	29.91	30.03	1.47	34.2	+ 8.2	55	40.3	11	28.1	24	3	26.4	77.5	4.47	+ 0.21	6,314	*	42	ne.	6	12	9	10	11	6.0	3.4	17	63	'76	—14	'73
New London	47	29.96	30.01	1.46	36.2	+ 8.2	55	42.5	12	29.9	21	3	29.4	78.6	3.54	— 0.90	6,348	w.	58	se.	9	11	12	8	10	5.2	3.6	17	65	'80	—10	'82
Mid. Atlantic States.					30.3	+ 6.3								4.61	+ 0.78															
Albany	85	29.92	30.02	1.48	31.0	+ 8.0	62	37.6	6	24.4	24	3	24.6	82.0	2.82	— 0.04	4,273	nw.	36	se.	17	1	18	12	10	7.8	6.2	16	62	'89	—18	'78
New York City	185	29.84	30.04	1.47	37.6	+ 7.6	58	43.5	17	31.7	24	4	29.4	76.8	5.38	+ 1.52	9,244	*	50	se.	17	3	16	12	11	5.7	4.4	18	64	†	— 6	'75
Harrisburg	361	29.68	30.09	1.40	32.4	.....	62	39.3	13	25.5	28	6	25.3	75.6	2.86	.....	5,924	nw.	48	nw.	21	7	12	12	11	5.9	4.4	1	62	'89	13	'89
Philadelphia	117	29.94	30.07	1.44	38.7	+ 6.7	59	45.0	18	32.4	24	5	28.6	77.2	3.75	+ 0.31	8,414	*	48	ne.	5	13	6	12	11	5.4	3.8	19	67	'76	— 5	'75
Atlantic City	34	30.03	30.06	1.43	37.6	+ 6.6	52	44.1	19	31.1	30	5	32.6	84.4	4.40	+ 0.55	7,934	w.	48	ne.	5	12	12	7	6	3.5	3.6	17	64	'80	— 3	'75
Baltimore	76	29.99	30.08	1.38	38.9	+ 5.9	60	44.8	20	33.0	20	5	28.4	70.4	4.22	+ 1.00	3,928	*	24	nw.	7	11	8	12	12	4.6	3.7	17	71	'76	— 6	'81
Washington City	103	29.95	30.07	1.38	39.2	+ 7.2	66	46.6	23	31.7	25	7	28.8	74.4	4.05	+ 0.63	3,811	nw.	26	nw.	21	15	7	9	11	5.3	3.5	19	71	†	—14	'51
Cape Henry	.....	.....	.....	.....	45.0	+ 5.0	67	52.3	29	37.5	26	4	.....	.....	5.81	+ 1.19	.....	no.	.....	.....	.....	.....	.....	.....	9	.....	.....	16	78	'76	9	'79
Lynchburgh	658	29.36	30.08	1.18	41.2	+ 5.2	69	51.2	18	31.3	32	8	27.0	67.3	5.26	+ 0.99	3,668	nw.	36	e.	4	10	7	14	12	5.4	3.9	16	74	'88	— 4	'77
Norfolk	69	30.00	30.07	1.28	44.4	+ 4.4	67	51.6	24	37.1	29	4	37.6	82.6	4.88	+ 0.90	6,491	sw.	42	sw.	9	8	10	13	9	6.9	3.5	19	80	'71	8	'79
S. Atlantic States.					49.6	+ 2.6								6.36	+ 1.78															
Charlotte	808	29.22	30.09	0.99	44.1	+ 4.1	70	52.5	22	35.7	27	5	31.0	68.2	6.15	+ 0.43	4,093	*	45	sw.	27	10	8	13	13	6.2	4.3	11	73	'88	— 1	'86
Hatteras	11	30.07	30.09	1.14	47.6	+ 3.6	65	52.2	32	42.9	18	3	45.0	90.4	6.82	+ 0.31	11,487	n.	42	se.	20	11	9	11	11	5.5	3.8	9	70	'85	14	'86
Kitty Hawk	.....	.....	.....	.....	49.0	+ 7.0	70	57.1	29	41.0	26	8	.....	.....	5.59	— 0.18	.....	ne.	.....	.....	.....	.....	.....	.....	13	.....	.....	15	73	'76	9	'84
Raleigh	375	29.68	30.08	1.12	44.2	.....	68	52.5	21	35.8	28	5	35.2	77.0	6.02	.....	3,255	nw.	18	*	*	14	9	8	13	5.2	3.7	3	75	'88	8	'87
Southport	.....	.....	.....	.....	49.4	+ 3.4	65	56.2	26	42.7	22	5	.....	.....	6.18	+ 2.52	.....	w.	.....	.....	.....	.....	.....	.....	10	.....	.....	14	72	'76	6	'84
Wilmington	52	30.02	30.08	1.02	50.1	+ 3.1	69	57.2	29	43.0	24	6	40.8	78.4	6.85	+ 2.97	5,573	ne.	38	sw.	27	8	8	15	10	5.4	5.5	19	77	'79	9	'84
Charleston	52	30.03	30.08	0.90	51.6	+ 1.6	71	58.1	29	45.2	25	3	44.0	81.2	6.46	+ 2.37	6,835	w.	26	se.	4	5	6	20	15	7.8	6.2	16	80	'79	10	'86
Columbia	.....	.....	.....	.....	45.1	.....	64	54.0	26	36.3	26	4	.....	.....	5.18	.....	.....	ne.	.....	.....	.....	.....	.....	.....	11	.....	.....	2	75	'88	21	'88
Augusta	183	29.92	30.12	0.92	47.6	+ 0.6	70	56.3	24	39.0	34	4	38.7	79.4	6.92	+ 2.36	3,312	w.	28	w.	27	8	9	14	10	6.5	5.9	17	78	'79	6	'86
Savannah	87	29.99	30.08	0.84	51.7	+ 0.7	69	58.9	29	44.5	26	3	45.0	83.8	6.30	+ 2.84	5,606	nw.	30	w.	28	6	7	18	13	7.4	5.2	19	80	'79	12	'86
Jacksonville	43	30.04	30.09	0.65	55.2	+ 0.8	74	63.0	31	46.8	29	7	49.0	84.6	5.89	+ 2.42	5,530	n.	35	se.	4	7	8	16	14	7.2	4.7	18	81	'88	15	'86
Florida Peninsula.					63.5	0.0								5.23	+ 2.20															
Cedar Keys	22	30.07	30.09	0.54	57.0	+ 1.0	70	62.0	36	52.1	21	4	50.4	82.8	8.04	+ 4.13	8,379	ne.	48	s.	4	4	7	20	11	6.8	5.8	10	77	'88	16	'86
Key West	22	30.05	30.07	0.38	70.0	— 1.0	79	74.0	54	65.9	16	3	66.8	88.8	2.42	+ 0.28	7,001	se.	48	nw.	28	3	17	11	13	7.3	4.8	19	90	'77	41	'86
Jupiter	28	30.04	30.07	0.46	66.7	.....	82	73.2	40	60.2	23	4	61.9	85.4	9.84	.....	7,740	nw.	28	ne.	11	10	6	15	14	6.0	6.3	2	83	'88	40	'89
Micco	.....	.....	.....	.....	63.9	.....	80	70.8	36	57.0	26	3	.....	.....	10.22	.....	.....	nw.	.....	.....	.....	.....	.....	.....	13	.....	.....	1	80	'89	36	'89
Titusville	12	30.09	30.10	0.53	60.4	.....	79	66.8	35	53.9	25	6	56.0	87.2	10.52	.....	6,952	nw.	26	ne.	23	5	9	17	14	6.7	6.5	2	80	'88	36	'88
Eastern Gulf States.					49.9	+ 1.2								5.86	+ 0.44															
Atlanta	1,129	28.89	30.10	0.89	43.8	+ 1.8	66	51.0	18	36.7	27	3	32.4	70.6	6.39	— 0.22	8,009	w.	44	w.	9	10	9	12	14	5.6	5.1	11	73	†	— 2	'86
Pensacola	56	30.02	30.08	0.66	52.7	+ 0.7	70	59.3	33	46.1	26	4	44.8	79.0	6.46	+ 1.28	7,412	ne.	36	nw.	28	5	8	18	14	6.8	6.3	9	74	'82	15	'86
Mobile	35	30.06	30.10	0.76	51.3	+ 1.3	69	59.0	31	43.6	28	4	44.0	81.7	5.07	— 0.12	5,497	nw.	36	se.	16	2	13	16	13	7.4	6.5	19	78	'82	11	'86
Montgomery	217	29.86	30.10	0.72	48.4	+ 0.4	70	56.4	26	40.3	31	4	36.6	69.0	6.70	+ 1.66	4,210	no.	29	w.	9	5	11	15	12	6.5	5.5	17	78	'82	5	'86
Vicksburg	222	29.85	30.09	0.87	49.3	+ 2.3	70	57.2	26	41.4	32	4	37.4	69.9	4.66	— 0.86	5,112	e.	36	w.	9	7	9	15	12	5.8	5.3	17	80	'79	3	'86
University	.....	.....	.....	.....	43.8	.....	62	51.3	22	36.3	26	4	.....	.....	5.21	.....	.....	se.	.....	.....	.....	.....	.....	.....	14	.....	.....	2	74	'88	10	'88
New Orleans	52	30.03	30.09	0.68	53.4	+ 0.4	73	60.1	34	46.6	30	4	44.8	79.0	6.51	+ 0.90	7,022	n.	36	se.	16	7	9	15	15	7.0	5.7	19	80	'86	15	'86
Auburn	.....	.....	.....	.....	40.9	.....	67	55.1	23	38.7	25	4	.....	.....	9.12	.....	.....	w.	.....	.....	.....	.....	.....	.....	10	.....	.....	1	67	'89	23	'89
Port Eads	.....	.....	.....	.....	54.9	.....	71	60.9	31	48.9	23	5	.....	.....	6.24	.....	.....	ne.	.....	.....	.....	.....	.....	.....	12	.....	.....	1	71	'89	31	'89
Western Gulf States.					45.7	+ 3.9								6.06	+ 2.75															
Shreveport	249	29.82	30.08	0.74	47.9	+ 2.9	69	56.1	25	39.7	31	3	38.4	73.2	4.02	— 0.97	5,890	nw.	36	nw.	28	10	10	11	13	6.0	5.3	16	78	'80	1	'86
Fort Smith	470	29.60	30.12	0.84	41.1	+ 8.1	65	50.1	13	32.1	38	4	32.5	78.4	5.33	+ 3.57	3,710	se.	20	nw.	9	11	10	10	10	4.7	4.8	7	73	'87	— 7	'96
Little Rock	309	29.76	30.10	0.84	43.6	+ 3.6	66	51.4	20	35.7	34	3	35.8	80.8	7.30	+ 2.93	4,025	nw.	24	*	*	11	8	13	10	5.6	4.7	10	78	'80	— 5	'86
Corpus Christi	20	30.06	30.10	0.74	55.1	+ 4.1	73	61.0	34	49.2	24	3	49.4	84.2	5.47	.....	7,879	nw.	36	nw.	*	5	13	13	12	7.1	5.9	2	73	'88	10	'88
Galveston	44	30.06	30.10	0.74	52.8	— 0.2	70	57.7	32	47.8	30	3	47.9	85.4	7.81	+ 3.99	9,501	se.	40	n.	8	7	6	18	15	6.9	5.9	18	75	'87	11	'86
Palestine	511	29.55	30.09	0.76	49.0	+ 7.0	70	58.8	25	39.3	34	5	42.2	83.9	6.82	+ 3.06	4,680	n.	30	w.	8	8	7	16	10	6.3	5.6	7	78	'88	0	'86
San Antonio	781	29.28	30.11	0.74	51.6	+ 1.6	80	60.3	28	42.8	31	4	39.9	73.6	5.11	+ 3.01	6,329	n.	34	n.	8	6	11	14	14	6.9	5.3	10	81	'86	6	'86
Rio Grande Valley.					68.0	+ 1.0								2.06	+ 0.54															
Rio Grande City	230	29.91	30.16	0.83	56.9	— 0.1	88	66.3	30	47.5	33	4	47.3	79.6	1.40	+ 0.36	4,113	n.	24	n.	20	6	9	16	6	5.8	4.3	10	90	'87	19	'81
Brownsville	57	30.04	30.10	0.73	59.2	+ 2.2	77	66.9	37	51.5	25	6	52.2	85.7	2.72	+ 0.73	7,389	*	40	s.	15	3	21	7	11	7.1	6.2	14	88	'87	18	'81
Ohio Val. & Tenn.					38.5	+ 4.6								3.57	— 1.08															
Chattanooga	783	29.26	30.11	0.99	42.6	+ 2.6	64	51.8	20	33.3	31	6	32.8	75.4	5.31	— 2.21	4,261	nw.	40	w.	9	12	4	15	15	6.3	4.5	11	73	'88	— 7	'86
Knoxville	980	29.06	30.12	1.01	40.8	+ 2.8	65	49.0	20	32.7	28	4	32.1	79.6	3.88	— 2.10	3,763	e.	40	w.	9	9	9	13	13	6.0	4.2	19	74	'76	—16	'84
Memphis	320	29.77	30.12	0.95	42.9	+ 3.9	65	49.2	21	36.6	28	3	33.0	73.1	5.28	— 0.42	4,287	se.	30	nw.	31	9	10	12	11	5.9	4.7	17	74	'88	— 8	'86
Nashville	549	29.49	30.08	0.89	40.9	+ 3.0	61	47.6	20	32.5	31	3	32.2	79.4	3.83	— 1.46	4,545	se.	36	w.	9	1	18	12	12	6.3	5.5	19	74	'79	—10	'84
Louisville	551	29.47	30.08	1.00	38.4	+ 4.4	60	46.4	17	30.3	34	5	28.6	69.4	3.07	— 1.12	6,219	w.	40	sw.	9	8	8	15	11	6.1	4.7	17	70	†	—20	'84
Indianapolis	766	29.22	30.06	1.24	34.2	+ 7.2	58	40.6	10	27.9	24	2	26.0	76.8	2.52	— 0.30	5,049	sw.	26	w.	10	9	6	16	11	5.3	6.2	16	69	'76	—25	'84
Terre Haute	.....	.....	.....	.....	35.6	.....	60	44.4	8	26.8	28	4	.....	.....	2.22	.....	.....	s.	.....	.....	.....	.....	.....	.....	12	.....	.....	2	60	'88	—10	'88
Cincinnati	628	29.37	30.07	1.28	37.2	+ 5.2	58	43.4	19	30.9	25	3	28.8	74.6	2.38	— 1.07	6,266	se.	48	sw.	9	6	10	15	11	6.3	5.7	19	69	'76	—12	'86
Columbus	812	29.17	30.06	1.31	34.2	+ 6.2	56	40.4	16	27.9	23	3	26.8	78.6	3.37	+ 0.10	6,204	w.	49	sw.	9	6	11	14	13	6.9	5.9	11	66	'87	—20	'84
Pittsburgh	847	29.11	30.02	1.22	36.5	+ 6.5	61	42.7	17	30.3	29	4	27.4	74.6	2.50	— 0.71	4,884	w.	32	sw.	9	4	18	19	14	6.8	5.8	16	75	'74	—13	'75
Parkersburgh	638	29.38	30.09	1.22	36.4	.....	60	43.4	17	29.5	29	2	29.1	79.1	3.03	.....	4,586	sw.	36	sw.	9	8	8	15	12	6.5	5.3	1	60	'89	17	'89
Lexington	.....	28.93	.....	1.05	37.4	.....	58	44.2	16	30.7	27	4	28.7	74.4	5.66	.....	8,710	se.	50	w.	9	8	4	19	12	7.3	6.1	2	68	'88	3	'88
Lower lakes region.					30.8	+ 6.5								2.06	+ 0.30															
Buffalo	690	29.24	30.00	1.44	29.8	+ 6.8	55	34.2	8	25.5	21	1	24.5	81.4	4.72	+ 1.96	10,809	sw.	78	sw.	10	4	8	19	15	7.9	6.3	17	65	'74	—14	'84
Oswego	335	29.62	30.00	1.45	28.8	+ 5.8	53	34.7	1	22.9	29	3	23.3	83.0	4.25	+ 1.33	10,089	se.	48	w.	10	3	6	22	16	8.4	6.8	19	64	'74	—23	'85
Rochester	621	29.32	30.01	1.44	29.5	+ 6.5	49	34.9	4	24.1	24	2	23.8	81.2	3.33	+ 0.22	8,049	w.	56	sw.	10	4	8	19	21	7.3	5.6	18	69	'74	—12	'73
Erie	714	29.23	30.02	1.37	32.2	+ 6.2	53	37.8	12	26.7	23	2	24.8	78.6	2.71	— 0.80	10,412	s.	50	sw.	10	2	11	18	19	8.7	6.9	16	73	'76	—15	'75
Cleveland	676	29.28	30.03	1.31	32.6	+ 7.6	57	38.5	13	26.8	25	2	25.4	78.8	3.13	+ 0.62	8,004	s.	41	sw.	9	8	6	17	12	7.4	6.2	17	70	'74	—17	'73
Sandusky	629	29.33	30.02	1.35	31.8	+ 6.8	57	37.5	13	26.1	26	2	24.6	78.1	2.43	+ 0.28	7,952	sw.	48	sw.	9	3	10	18	12	7.6	6.1	12	69	'80	—16	'79
Toledo	673	29.28	30.03	1.44	31.6	+ 6.6	58	37.9	12	25.2	29	3	24.8	80.6	1.50	— 0.70	8,348	sw.	55	sw.	9	4	18	14	7.8	6.1	19	66	'76	—14	'84
Detroit	602	29.28	30.02	1.53	29.8	+ 5.8	49	35.3	7	24.3	24	4	23.8	82.5	1.51	— 0.52	8,109	sw.	47	sw.	9	5	8	18	13	7.1	6.1	19	66	'76	—15	'79
Upper lakes region.					25.4	+ 5.0								3.30	+ 0.36															
Alpena	609	29.28	29.97	1.74	24.4	+ 8.4	46	29.4	4	19.5	23	2	21.0	87.9	3.26	+ 0.79	6,935	w.	32	*	*	2	7	22	19	8.5	7.0	17	52	'80	—27	'82
Escanaba	608	.....	.....	.....	23.4	+11.4	42	31.0	0	15.7	28	3	.....	.....	1.54	+ 0.03	.....	nw.	.....	.....	.....	.....	.....	.....	12	.....	.....	15	45	'79	—29	'88
Grand Haven	630	29.29	29.97	1.52	29.0	+ 6.0	53	33.6	11	24.4	24	4	24.8	85.8	1.61	— 0.90	9,710	sw.	60	nw.	9	4	4	23	13	8.3	7.6	17	57	'80	—12	'73
Lansing	883	29.04	30.04	1.53	27.6	.....	51	34.1	6	21.1	30	2	24.4	92.8	1.93	.....	6,087	sw.	36	sw.	9	5	12	14	15	6.8	6.2	3	51	'89	—14	'87
Manistee	615	29.28	29.99	1.50	26.6	.....	50	31.4	5	21.9	23	2	20.9	78.0	3.05	.....	6,699	ne.	36	*	*	3	5	23	12	8.4	7.5	1	50	'89	5	'89
Marquette	672	29.22	29.98	1.50	23.3	+ 9.3	45	29.6	3	17.0	26	4	16.9	79.0	3.94	+ 2.48	6,374	nw.	32	s.	24	4	8	19	19	6.8	6.2	14	56	'80	—26	'81
Port Huron	639	29.30	30.01	1.61	28.4	+ 8.4	52	34.1	5	22.7	27	2	22.2	81.0	3.06	+ 1.09	9,487	sw.	54	sw.	10	6	5	20	14	7.9	6.3	15	64	'76	—15	'85
Chicago	715	29.22	30.01	1.46	29.0	+ 7.0	55	35.0	0	23.0	27	2	23.6	82.8	1.64	— 0.54	7,807	nw.	44	sw.	17	10	8	13	5	5.2	3.9	17	65	'76	—20	'73
Milwaukee	697	29.22	30.00	1.47	26.2	+ 8.2	50	32.0	3	20.5	28	2	20.6	81.6	1.95	— 0.28	8,374	w.	48	*	*	11	6	14	10	5.8	5.3	19	59	†	—25	'75
Green Bay	616	29.31	30.01	1.45	20.2	.....	43	26.5	— 2	13.8	25	2	15.7	84.4	3.75	.....	5,344	s.	36	s.	*	7	9	15	13	6.3	6.5	3	43	'89	—36	'88
Duluth	672	29.25	30.02	1.54	19.6	+13.6	45	26.3	—13	13.0	26	2	14.4	83.3	1.34	+ 0.22	4,741	nw.	34	*	*	5	14	12	13	5.4	4.6	17	51	'77	—41	'85
Sault de St. Marie	642	29.24	29.97	1.67	20.4	.....	42	26.6	—13	14.3	28	3	16.2	86.0	2.80	.....	5,220	e.	28	sw.	17	1	9	21	18	7.6	7.3	1	42	'89	—13	'89
Extreme northwest.					10.5	+14.3								0.61	— 0.02															
Moorhead	926	29.02	30.09	1.18	9.8	+13.8	46	19.0	—29	0	40	2	5.8	89.4	1.13	+ 0.35	6,802	n.	37	n.	30	10	9	12	6	3.8	3.6	9	46	'89	—48	'87
Saint Vincent	804	29.15	30.08	1.17	6.7	+15.7	48	15.4	—36	— 2.0	34	7	2.7	86.4	0.82	+ 0.38	6,750	nw.	38	nw.	*	9	7	15	10	5.6	4.0	9	48	'89	—54	'88

Table of miscellaneous meteorological data for January, 1889—Signal Service observations—Continued.

Stations and districts.	Elevation above sea-level, feet.	Pressure, in inches.			Temperature of air, in degrees Fahrenheit.							Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.		Wind.				Cloudless days.	Partly cloudy days.	Cloudy days.	Days with rainfall.	Average cloudiness, tenths.		Temperature data since opening of station.				
		Mean actual.	Mean reduced.	Monthly range.	Monthly mean.	Departure from normal.	Maximum.	Mean Maximum.	Minimum.	Mean minimum.	Greatest daily range.	Least daily range.				Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					8 a. m.	8 p. m.	Length of record, years.	Absolute maximum.	Year.	Absolute minimum.	Year.
Ex. northwest—Con.																														
Bismarck	1,681	28.22	30.12	1.06	14.7	+12.7	46	34.8	−18	4.6	48	4	10.0	86.2	0.50	− 0.15	7,151	nw.	48	nw.	*	7	15	9	12	4.3	4.0	15	49	'80	−44	'87
Fort Buford	1,900	27.98	30.12	0.94	10.6	+ 8.6	45	23.0	−18	− 1.7	48	11	6.5	87.9	0.13	− 0.52	5,265	nw.	38	nw.	25	8	19	4	6	4.4	2.2	11	47	'80	−49	'88
Fort Totten	1,487	28.38	30.09	1.09	10.6	+20.6	44	19.3	−25	1.9	43	7	6.2	86.5	0.23	− 0.31	8,133	nw.	36	*	*	10	8	13	8	4.8	4.3	5	44	'89	−43	'86
Fort Yates					17.1		53	28.1	−15	6.1	46	7			0.87	+ 0.10		nw.										7	60	'85	−46	'84
Upper Miss. Valley.					27.3	+ 6.6									1.93	+ 0.00														
Saint Paul	831	29.09	30.02	1.40	20.2	+10.2	42	28.0	−10	12.5	38	4	14.0	84.8	0.55	− 0.51	4,458	nw.	26	nw.	28	5	13	13	10	5.5	5.7	18	49	'79	−41	'88
La Crosse	744	29.25	30.08	1.33	20.4	+ 6.4	45	28.0	− 7	12.7	29	4	15.0	82.4	1.45	+ 0.20	5,506	s.	32	nw.	31	9	11	11	13	5.9	4.8	17	59	'74	−43	'73
Davenport	615	29.36	30.05	1.19	20.4	+ 7.4	55	33.6	− 1	19.2	27	4	19.3	78.9	0.95	− 0.76	6,072	nw.	40	sw.	16	15	3	13	7	4.9	4.0	17	60	'74	−27	'84
Des Moines	866	29.12	30.08	1.12	23.0	+ 6.0	50	31.4	− 1	14.5	32	4	15.4	76.6	1.22	− 0.04	5,489	nw.	30	nw.	16	14	5	12	5	4.3	4.0	11	62	'80	−30	'84
Dubuque	665	29.30	30.05	1.27	23.6	+ 7.6	52	31.5	− 4	15.8	31	3	17.2	82.4	1.55	− 0.14	3,079	nw.	26	sw.	16	15	4	12	7	4.1	4.7	16	62	'74	−32	'87
Keokuk	618	29.40	30.08	0.97	28.2	+ 6.2	62	35.7	1	20.6	30	1	22.0	82.0	1.89	+ 0.22	6,352	nw.	36	sw.	16	13	5	13	8	4.5	4.6	18	64	'74	−24	'84
Cairo	359	29.70	30.10	1.01	38.0	+ 5.0	61	44.6	19	31.5	25	4	30.6	78.2	4.61	+ 0.64	5,694	w.	35	e.	16	7	9	15	13	6.4	5.0	18	73	'88	−16	'84
Springfield, Ill	644	29.37	30.08	1.04	30.8	+ 4.8	58	37.9	2	23.6	26	4	22.8	77.7	2.13	+ 0.06	7,408	nw.	40	w.	9	9	8	14	7	5.2	4.8	10	64	'80	−22	'84
Saint Louis	571	29.46	30.09	0.97	34.8	+ 5.8	64	42.3	13	27.4	30	3	26.2	75.6	3.04	+ 0.91	8,550	w.	48	*	*	9	12	10	8	5.6	4.3	19	72	'80	−22	'84
Missouri Valley.					20.7	+ 7.3									1.12	+ 0.46														
Springfield, Mo	1,356	28.60	30.10	0.87	35.5		60	44.1	4	26.9	31	4	27.4	80.7	2.45		7,403	se.	36	sw.	16	6	16	9	9	4.5	4.1	4	69	'82	−11	'88
Leavenworth	842	29.19	30.11	1.06	29.8	+ 5.8	52	37.5	4	22.0	33	3	22.4	81.7	1.06	− 0.26	4,835	nw.	26	nw.	9	12	10	9	7	4.3	3.7	18	65	'76	−29	'73
Topeka					28.7		53	41.0	3	16.4	42	88			0.63			*										2	58	'88	−20	'88
Omaha	1,113	28.89	30.12	1.07	24.0	+ 7.0	47	32.2	− 2	15.8	38	4	16.8	78.2	1.62	+ 1.04	6,205	nw.	38	nw.	27	12	7	12	7	4.7	3.5	17	62	†	−32	'84
Crete					25.7										1.45													2	55	'88	−28	'88
Valentine	2,613	27.28	30.16	0.91	24.6		58	39.1	−10	10.2	54	6	13.7	74.4	1.27		7,305	w.	60	nw.	28	18	4	9	9	2.9	2.1	4	63	'88	−35	'88
Fort Sully	1,600	28.33	30.11	0.98	16.8	+ 8.8	45	26.0	−19	7.7	41	3	10.6	77.5	0.70	+ 0.14	6,110	nw.	45	nw.	*	15	8	8	10	3.5	2.7	10	55	†	−39	'83
Huron	1,307	28.64	30.12	1.12	12.7	+ 7.7	42	23.1	−25	2.3	46	5	5.7	77.8	1.26	+ 0.95	7,012	nw.	42	nw.	30	11	9	11	9	4.5	4.8	8	46	'85	−43	'87
Yankton	1,234	28.74	30.11	1.15	20.0	+ 7.0	47	30.0	−12	9.9	43	5	11.0	74.5	0.96	+ 0.42	5,580	nw.	41	nw.	28	16	10	5	5	4.2	2.0	16	67	'80	−32	'81
Kansas City	947	29.06	30.12	1.07	31.2		52	38.8	4	23.7	32	3	22.7	75.3	1.08		5,336	n.	25	n.	8	14	4	13	7	3.7	4.2	1	52	'89	4	'89
Northern slope.					17.9	+ 4.3									0.48	− 0.61														
Fort Assinaboine	2,720	27.18	30.13	0.77	14.8	+ 6.8	51	24.4	−21	5.1	48	6	6.6	71.4	0.26	− 0.88	8,612	sw.	60	sw.	23	13	5	13	5	3.2	4.5	9	53	'88	−49	'86
Fort Custer	3,040	26.87	30.18	0.85	16.1	+ 1.1	48	27.8	−12	4.4	39	7	9.7	82.2	0.20	− 0.79	4,168	se.	32	nw.	25	12	10	9	7	4.7	5.2	10	59	'88	−45	'88
Fort Maginnis	4,340	25.51	30.03	0.80	23.4	+ 7.4	52	33.0	−17	13.9	33	8	14.5	66.6	1.13	− 0.85	9,555	nw.	50	nw.	24	12	13	6	10	3.1	3.0	7	60	'88	−39	'88
Helena	4,069	25.87	30.21	0.75	10.7	+ 0.7	48	27.3	−14	6.1	37	8	8.6	76.4	0.42	− 1.15	2,683	sw.	36	w.	25	17	10	4	5	3.2	3.4	9	57	'85	−41	'88
Poplar River	2,030	27.90	30.14	0.89	9.3	+13.3	44	21.7	−19	− 3.1	47	5	4.8	87.4	0.21	− 0.28	3,280	w.	45	n.	25	5	20	6	6	4.7	3.2	6	45	'84	−63	'85
Rapid City	3,280	26.60	30.14	0.83	22.8		57	33.2	− 3	12.5	40	7	14.0	75.3	0.52		5,943	*	42	n.	25	11	17	3	7	4.7	2.1	4	66	'88	−37	'83
Cheyenne	6,105	23.93	30.12	0.81	24.7	+ 0.7	51	36.2	0	13.2	39	4	3.1	51.2	0.23	− 0.05	8,330	nw.	48	nw.	11	12	13	6	6	2.6	2.7	16	64	'88	−38	'75
Fort Laramie					24.2		51	36.1	− 9	12.4	44	8			0.43	− 1.41		w.										4	68	'88	−38	'84
North Platte	2,841	27.09	30.16	0.88	20.5	+ 0.5	48	32.4	− 9	8.6	40	4	10.9	75.1	0.97	+ 0.51	5,908	w.	37	n.	25	13	12	6	6	3.5	2.7	15	70	'80	−35	'88
Fort McKinney		24.91	30.14	0.90	24.6		52	35.0	− 6	14.2	33	10	14.1	71.8	0.41		5,989	w.	60	nw.	25	15	11	5	3	2.9	3.3	2	60	'88	−36	'88
Fort Washakie		24.43	30.20	0.84	9.4		44	23.2	−16	− 4.3	40	10	−1.0	77.8	0.75		2,826	sw.	24	*	*	25	5	1	5	3.2	1.8	3	51	'83	−42	†
Middle slope.					29.7	+ 4.0									1.27	+ 0.87														
Colorado Springs					35.4		55	39.1	− 4	11.7	40	7	7.6	58.6	0.16	+ 0.03												2	63	'88	−23	'88
Denver	5,281	24.71	30.14	0.84	27.2	− 1.8	56	40.2	4	14.1	41	3	12.6	66.1	0.50	− 0.11	4,774	s.	36	n.	7	14	11	6	8	2.7	3.8	18	76	'88	−29	'75
Pueblo	4,724	25.24	30.23	0.80	24.8		57	39.2	−11	10.4	45	4	9.6	64.2	0.34		4,123	nw.	48	n.	25	15	12	4	4	4.1	2.7	1	57	'89	−11	'89
Concordia	1,384	28.58	30.10	1.01	29.0	+12.0	56	39.3	3	18.8	42	4	18.1	73.2	1.42	+ 0.84	5,205	nw.	28	s.	11	21	6	4	5	2.7	1.8	4	61	'88	−25	'88
Dodge City	2,523	27.42	30.16	0.85	28.9	+ 3.9	58	40.7	11	17.1	42	4	18.2	75.4	1.69	+ 1.32	7,316	w.	42	nw.	28	16	11	4	4	2.7	2.7	15	73	†	−20	'83
Fort Reno					38.0		69	48.9	14	27.1					2.59	+ 2.28		nw.										7	72	'87	−20	'86
Fort Supply					37.0		62	50.0	18	25.1	42	10			0.88	+ 0.43		s.										3	74	'87	−17	'81
Fort Elliott	2,650	27.27	30.07	0.80	33.7	+ 1.7	60	44.4	15	23.0	38	4	22.0	70.8	1.63	+ 1.32	9,613	nw.	55	nw.	26	18	5	8	4	2.9	3.2	10	80	'60	−14	'88
Wichita	1,354	28.60	30.10	0.92	32.8		54	42.1	10	23.4	44	4	23.7	76.2	0.82		8,983	s.	46	n.	27	16	9	6	3	3.3	2.6	1	54	'89	−10	'89
Southern slope.					41.2	+ 5.2									2.26	+ 1.70														
Fort Sill	1,200	28.83	30.12	0.87	39.2	+ 4.2	71	49.6	18	28.9	36	3	29.2	78.5	2.71	+ 1.84	6,735	n.	40	n.	8	18	5	8	8	3.3	3.3	12	76	'87	− 9	'79
Abilene	1,748	28.26	30.12	0.75	43.3	+ 2.3	73	52.1	23	34.5	30	5	30.2	82.8	2.74	+ 2.43	7,003	sw.	40	nw.	8	10	10	11	6	4.8	3.8	4	83	'87	− 5	'86
Fort Stanton	6,154	23.89	29.97	0.59	29.0		54	41.4	5	17.9	36	7	15.4	61.6	1.33	+ 0.83	5,267	w.	36	*	*	10	17	4	6	4.1	3.3	6	61	'87	− 4	'86
Southern plateau.					38.1	− 2.0									1.60	+ 0.80														
El Paso	3,796	26.21	30.06	0.72	41.5	− 2.5	67	52.4	20	30.6	37	6	23.6	55.6	0.76	+ 0.26	5,236	nw.	36	*	*	12	11	8	6	3.6	3.6	11	75	'88	5	'81
Lava					32.2		61	43.8	1	20.5	34	11			1.60	+ 1.49		sw.										5	68	'85	− 1	'85
Santa Fé	7,026	23.17	30.10	0.63	24.6	− 2.4	46	34.2	0	15.1	28	6	9.0	58.2	0.84	+ 0.35	4,414	ne.	36	se.	14	21	5	5	2	2.8	2.6	17	76	'79	−13	'83
Fort Apache	5,020				35.6	+ 0.6	60	49.9	7	21.3	40	15			2.21	+ 0.82		sw										6			11	67	†	−10	'80
Fort Bowie					38.1		56	44.8	19	31.4	22	5			1.38	− 0.45		sw.										6	68	'86	1	'84
Fort Grant	4,860	25.19	30.10	0.57	40.0	− 3.0	61	48.5	20	31.6	26	7	24.6	60.6	1.99	+ 1.22	5,116	nw.	36	e.	*	17	9	5	4	2.8	2.8	10	77	'79	10	'83
Fort McDowell					46.2		67	58.5	26	33.8	36	10			2.85	+ 1.94		ne.										6			6	77	'86	12	'80
Fort Thomas	2,710				42.4	+ 1.4	65	54.7	22	30.0	34	11			1.47	+ 0.85		w.										6			9	74	'88	10	'84
Fort Verde					38.5		62	53.2	15	23.8	38	16			1.95	+ 1.23		w.										4			12	73	'79	1	'83
Whipple Barracks	5,389	24.67	30.11	0.74	28.4	− 6.6	54	40.9	− 5	15.0	33	5	18.2	74.9	1.73	+ 0.41	4,985	s.	52	sw.	18	19	5	7	7	3.0	2.8	13	70	'82	−17	'80
San Carlos					42.0		64	54.0	23	30.1	35	9			1.62	+ 0.58												5	72	'83	12	'85
Wilcox					40.1		68	54.2	18	26.0	39	9			1.31	+ 1.01		w.										3	68	'84	2	'84
Yuma	141	29.87	30.02	0.85	53.4	− 0.6	72	63.9	35	42.8	33	10	34.4	53.3	1.12	+ 0.76	5,667	n.	35	n.	19	22	3	6	3	2.0	2.3	14	80	'79	22	'83
Keeler	3,622	26.35	30.07	0.81	39.0	− 3.0	59	47.5	23	30.5	28	8	22.2	55.0	0.04		3,778	*	47	nw.	25	19	6	6	1	2.5	2.6	4	67	'86	12	'88
Middle plateau.					21.1	− 7.9									0.55	− 0.45														
Winnemucca	4,340	25.71	30.27	0.76	21.6	−11.4	49	35.0	−14	8.1	36	12	12.5	69.8	0.32	− 0.73	7,319	ne.	30	ne.	14	17	10	4	4	2.1	4.0	11	57	'87	−28	'88
Salt Lake City	4,348	25.72	30.28	0.95	21.4	− 6.6	44	29.9	− 5	12.9	23	6	14.0	74.0	0.73	− 0.74	2,256	se.	18	se.	11	19	7	5	5	2.8	3.6	15	54	'79	−20	'83
Montrose	5,795	24.28	30.21	0.80	20.2	− 5.8	44	32.9	− 6	7.6	35	8	9.2	70.0	0.59	+ 0.12	3,051	se.	26	nw.	7	17	6	8	5	4.3	3.1	4	60	'87	−20	'88
Carson City					31.0		55	43.1	− 1	19.0	39	6	18.7	65.6	0.06													2	58	'88	−10	'88
Brock's					15.0		40	28.4	−12	1.5	38	9			0.87			e.										1	40	'59	−12	'89
Fort Du Chesne		25.11	30.31	0.88	6.8		38	21.2	−21	− 7.7	36	14	−6.0	74.4	0.39		1,073	nw.	17	ne.	14	16	8	7	3	3.2	3.0	2	42	'88	−38	'88
Northern plateau.					24.0	− 3.4									1.19	− 2.21														
Boise City	2,750	27.33	30.30	0.90	23.9	− 6.1	47	35.3	2	12.5	33	12	14.7	75.8	0.44	− 1.91	1,779	n.	22	s.	17	12	7	12	6	1.9	4.8	12	61	'84	−28	'88
Ashland					40.1		64	50.8	16	29.4	39	10			0.85	− 3.12		w.										7			5	66	'85	− 3	'86
Fort Klamath					22.8		46	34.8	− 8	10.8	37	11			2.28	− 2.48		w.										8			6	51	'86	−15	'86
Linkville					27.4		45	37.1	0	17.8	28	10			0.55	− 2.57		n.										7			6	58	'87	−24	'88
Spokane Falls	1,909	28.13	30.24	0.86	24.2	− 0.8	40	30.3	2	18.2	22	4	21.3	91.0	1.85	− 1.00	1,871	ne.	15	sw.	*	2	6	23	10	6.1	8.0	8	52	'88	−30	'88
Walla Walla	1,018	29.10	30.24	0.89	28.7		52	34.3	11	23.1	27	3	24.6	88.2	0.47	− 1.35	3,017	sw.	26	sw.	20	2	9	20	8	5.7	7.8	4	65	'88	−17	'88
N. Pac. coast region.					40.5	+ 0.3									2.80	− 3.86														
Fort Canby	179	29.86	30.06	0.87	42.4	+ 0.4	57	46.5	32	38.4	16	4	38.1	82.2	9.36	+ 0.81	10,374	se.	54	se.	17	7	6	18	20	6.5	5.9	6	57	'89	11	'88
Neah Bay					43.2		57	47.9	28	36.6	16	5			9.33	− 7.96		e.										18			6	52	'84	14	'88
Olympia	36	30.06	30.10	0.91	37.6	− 1.4	50	43.0	22	32.1	17	2	34.8	88.6	4.05	− 4.91	2,897	s.	17	s.	31	3	10	18	18	7.1	7.7	12	58	'85	− 2	'88
Port Angeles	14	30.05	30.06	1.11	37.5	+ 1.5	50	43.1	26	31.9	16	6	31.3	85.6	2.96	− 2.91	2,818	s.	24	sw.	6	4	8	19	17	6.7	6.5	6	54	'88	− 6	'88
Pysht					36.9		48	41.1	26	32.7	17	3			5.89	− 6.62		ne.										17			6	52	'85	8	'88
Tatoosh Island	86	29.93	30.02	1.09	43.6	+ 2.6	55	47.2	34	40.1	13	4	40.0	88.7	8.40	− 5.74	13,099	e.	68	e.	27	8	6	17	20	6.7	6.9	6	56	'84	14	'88
Astoria	38				40.7	− 0.3	56	47.3	30	37.5	18	5			10.67	− 1.10		ne.										21			5	60	'88	10	'88
Portland	80	30.04	30.13	0.83	38.4	− 1.6	55	44.7	24	32.2	18	6	33.5	83.6	4.78	− 2.66	3,770	s.	30	s.	21	7	4	20	16	5.6	6.2	16	62	'88	− 2	'88
Roseburgh	523	29.56	30.13	0.75	42.0	+ 1.0	59	50.9	22	33.0	26	9	37.1	86.7	2.96	− 3.68	1,947	e.	17	s.	20	5	19	7	13	6.3	5.1	12	71	'88	− 6	'88
Mid. Pac. coast reg.					47.0	− 0.8									0.85	− 3.90														
Eureka	64	30.04	30.10	0.67	46.9		71	55.1	29	38.7	35	7	41.3	79.5	4.25		3,763	n.	36	n.	15	13	9	9	13	4.6	4.6	3	77	'86	20	'88
Red Bluff	342	29.76	30.11	0.72	45.8	− 1.0	68	54.8	30	35.1	36	5	32.8	67.4	0.51	− 4.39	4,455	n.	30	n.	14	17	5	9	7	1.7	3.4	12	72	'80	18	'88
Sacramento	64	30.02	30.09	0.86	44.7	− 1.3	62	53.6	31	35.8	30	4	37.6	78.1	0.15	− 3.83	3,708	nw.	27	nw.	14	18	9	4	3	2.1	3.2	12	65	'87	19	'88
San Francisco	60	30.02	30.09	0.77	50.4	+ 0.4	64	56.5	40	44.3	19	4	41.2	75.8	1.28	− 3.65	3,715	n.	36	ne.	26	13	13	5	7	3.1	4.3	18	73	'87	29	'88
S. Pac. coast region.					53.6	+ 0.6									0.98	− 1.37														
Fresno	313	29.76	30.11	0.83	43.9		63	53.0	28	34.5	32	5	38.8	85.6	0.34		2,044	w.	12	*	*	16	5	10	2	2.0	2.4	2	68	'88	20	'88
Los Angeles	330	29.67	30.02	0.83	52.4	− 0.6	71	63.4	32	41.5	34	6	36.3	59.4	0.25	− 2.53	2,371	w.	17	n.	22	19	6	6	4	2.1	2.8	12	82	'83	30	†
San Diego	91	29.92	30.02	0.74	54.8	+ 1.8	78	66.9	36	42.8	33	6	45.1	79.5	1.72	− 0.21	3,568	nw.	24	e.	24	19	4	8	5	1.9	3.5	18	78	'89	32	'80

NOTE.—The data at stations having no departures are not used in computing the district averages. *Two or more dates or directions. †Two or more years. Letters of the alphabet denote number of days missing from the record.

ANNUAL SUMMARY FOR 1888.

Two additional charts (numbers viii and ix) are published with this issue of the REVIEW showing, respectively, the annual isotherms and departures from the normal temperature, and the annual precipitation for 1888.

TEMPERATURE.

The annual mean temperature was highest over southern Florida, where the readings ranged above 75°. Over Florida south of the twenty-ninth parallel, and in the lower Rio Grande and lower Colorado valleys, the mean temperature was above 70°. In the southern states south of the thirty-fifth parallel and east of the ninety-fifth meridian, a greater portion of Texas, southern New Mexico, and southern Arizona, and the southern half and north-central part of California, the values rose above 60°. The mean temperature was lowest in the lower Saint Lawrence valley, over the northern part of Lake Superior, Manitoba, northern Minnesota, and northern Dakota, where it fell below 35°. It was below 40° north of the forty-fifth parallel, except in the Rocky Mountain regions and on the Pacific coast, where it increased gradually to nearly 55° in Oregon. Over the middle plateau region of the Rocky Mountains, within a limited area embracing central and northwestern Nevada, and adjacent portions of California and Oregon, the mean temperature fell below 50°.

The annual mean temperature corresponded with the normal along a line traced irregularly southward from Montana to western Texas; at stations in Manitoba, the lower Mississippi valley, southwestern New England, along the west coast of the Gulf of Saint Lawrence, and along a line inclosing an area extending from Pennsylvania south-southwest to north-central Florida. The means were above the normal in the Rocky Mountain regions and on the Pacific coast. Over the eastern and central portions of the country the year was colder than the average, save in the localities above referred to in which normal temperatures were noted, where small excesses were reported.

The departures above the normal were most marked over the middle and northern plateau regions of the Rocky Mountains, and along a considerable portion of the Pacific coast, where they generally ranged between one and two degrees. The departures below the normal were greatest in portions of the upper lake region and upper Mississippi valley, over the eastern end of Lake Ontario, and at stations on the New England coast, where they, in instances, exceeded three degrees.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.	°	Below normal.	°
Salt Lake City, Utah	1.9	Portland, Me	3.8
Roseburgh, Oregon	1.9	Oswego, N. Y	3.2
Spokane Falls, Wash	1.6	La Crosse, Wis	3.0
New Haven, Conn	1.6	Saint Paul, Minn	2.8
Red Bluff, Cal	1.5	Detroit, Mich	2.7
Pittsburgh, Pa	1.5	Grand Haven, Mich	2.5

PRECIPITATION.

The greatest amount of precipitation for the year was reported at Neah Bay, Makah Indian Reservation, in the extreme northwest part of Washington, where a total of 102.97 inches fell. Along and near the coasts of the middle Gulf states the rainfall exceeded 70 inches, and at New Orleans, La., it amounted to 83.1 inches. On the Atlantic coast the rainfall was heaviest over the western part of Nova Scotia, where it amounted to 67.9 at Yarmouth, N. S., at stations in New England, in the south Atlantic states, and on the east-central coast of Florida, where it exceeded 50 inches. From the Atlantic and Gulf coasts the amount of rainfall decreased gradually, though somewhat irregularly, to the Rocky Mountain regions, where in the middle districts it generally fell below 10 inches. The rainfall was also less than 10 inches along the southern border from the western extremity of Texas to southern California, and in east-central California. On the Pacific coast there was a gradual decrease in the amount of rainfall reported from Washington southward to southern California, where it amounted to 11.6 inches at San Diego.

As compared with the annual normal the excesses and deficiencies in precipitation for 1888 were irregularly distributed over the country. Among the more remarkable features may be noted the large deficiency in rainfall at Block Island, R. I. At this station the precipitation was 24 inches less than the average for previous years, while at New Haven, Conn., Portland, Me., and Yarmouth, N. S., the excesses were, respectively, 11.3, 18.1, and 21.8 inches. Deficiencies exceeding 10 inches were also reported at Portland, Oregon, Tatoosh Island, Wash., Hatteras, N. C., Moorhead, Minn., Cedar Keys, Fla., Omaha, Nebr., and at Vicksburg, Miss. The most marked excesses in precipitation, other than those above noted, occurred along the middle and a portion of the west Gulf coast, where they were more than 10 inches, the greatest, 19.3, occurring at New Orleans, La.; at Fort Smith, Ind. T., and Fort Maginnis, Mont., the yearly precipitation exceeded the average by 10.4 and 10.2 inches, respectively. Over the plateau and Pacific coast regions the rainfall was deficient, except over the southern half of California, southern Nevada, and northern and western Arizona, where there was a slight excess.

The following table gives annual summaries of temperature and precipitation observations at the older established Signal Service stations during 1888, together with the departures from the annual normals:

Stations and districts.	Temperature—degrees Fahrenheit.						Precipitation in inches.		
	Mean for 1888.	Departure from normal.	Extremes for 1888. Max.	Date of max.	Min.	Date of min.	Total for 1888.	Departure from normal.	Percentage of normal.
New England.									
Eastport	40.2	−1.4	88.0	June 23	−12.2	Jan. 25	53.2	+ 2.8	106
Portland	42.8	−3.8	96.5	June 23	−12.3	Jan. 29	59.2	+18.1	144
Manchester	44.2	.....	96.3	June 23	−11.0	Feb. 10	46.8	.....	.....
Northfield	39.5	.....	89.2	June 23	−24.1	Jan. 25	45.9	.....	.....
Boston	47.3	−1.5	96.2	June 23	− 6.2	Jan. 29	45.9	− 1.0	98
Nantucket	47.5	.....	81.0	Aug. 3, 19	− 3.5	Jan. 29	45.7	+ 8.4	122
Wood's Holl	46.6	.....	79.0	Aug. 3-4	− 3.9	Jan. 29	49.4	.....	.....
Block Island	46.9	−2.6	82.6	June 23	− 3.0	Jan. 22	27.2	−24.0	53
New Haven	47.4	+1.6	94.1	June 23	− 4.4	Jan. 22	60.3	+11.3	123
New London	48.6	−0.8	91.8	June 23	− 3.0	Jan. 22	45.0	− 3.7	92
Middle Atlantic states.									
Albany	46.1	−2.9	96.2	June 23	−10.0	Feb. 10	44.7	+ 7.0	119
New York City	51.4	−0.6	96.3	Aug. 16	1.9	Jan. 22	53.0	+ 9.1	121
Philadelphia	52.8	−1.3	97.8	Aug. 8	2.4	Jan. 22	44.1	+ 3.7	109
Atlantic City	50.8	−1.6	91.0	July 7	2.5	Jan. 22	44.1	+ 1.5	104
Baltimore	53.8	−1.8	95.8	Aug. 16	9.2	Jan. 22	43.5	+ 0.4	101
Washington City	53.8	−1.3	97.2	Aug. 8	9.2	Jan. 28	45.0	+ 1.2	103
Norfolk	58.4	−1.1	98.4	Aug. 8	14.1	Mar. 14	56.6	+ 5.5	111
South Atlantic states.									
Charlotte	60.6	+0.3	100.0	Aug. 7	15.5	Feb. 26	52.6	− 2.9	95
Hatteras	60.7	−0.7	87.8	Aug. 9	22.5	Jan. 28	56.7	−14.3	80
Raleigh	59.0	.....	101.0	June 21, July 12	15.0	Feb. 28	56.9	.....	.....
Wilmington	62.6	−1.0	95.9	July 12	20.0	Jan. 19	55.1	− 2.4	96
Charleston	65.8	−0.5	100.2	July 13	26.0	Jan. 19	49.5	− 8.6	85
Columbia	63.2	.....	100.6	July 12	21.3	Jan. 19	47.9	.....	.....
Augusta	64.6	−0.4	103.8	July 8	22.0	Feb. 28	49.9	+ 4.8	111
Savannah	66.4	−0.7	99.0	July 8	25.0	Dec. 21	47.1	− 5.8	89
Jacksonville	69.5	−0.4	98.4	July 13	27.5	Jan. 19	53.1	− 4.1	93
Florida peninsula.									
Titusville	70.6	.....	95.0	July 13	32.0	Dec. 21	60.0	.....	.....
Cedar Keys	70.4	0.0	91.0	Sept. 4	29.3	Jan. 19	43.1	−13.4	78
Key West	76.8	−1.1	91.0	Aug. 4	51.6	Dec. 21	35.6	− 3.8	90
Jupiter	78.6	.....	94.0	July 12	36.4	Dec. 22	52.4	.....	.....
East Gulf states.									
Atlanta	61.1	0.0	95.7	Aug. 7	13.0	Feb. 26	65.0	+ 9.9	118
Pensacola	67.8	−0.3	94.0	July 14	26.1	Jan. 19	61.9	− 3.3	95
Mobile	66.8	−0.7	96.6	July 14	23.0	Jan. 19	75.6	+11.4	118
Montgomery	65.6	−0.3	97.6	July 14	17.5	Jan. 19	61.4	+ 8.1	115
Vicksburg	65.4	−0.6	97.0	July 14	17.5	Jan. 16	48.5	−10.9	83
New Orleans	69.2	−0.2	96.5	July 15	28.8	Jan. 19	83.1	+19.3	130
West Gulf states.									
Shreveport	65.2	−1.2	98.5	July 14	15.0	Jan. 15	44.8	− 9.2	84
Fort Smith	60.5	−0.1	100.0	Aug. 1	1.2	Jan. 15	51.0	+10.4	126
Little Rock	61.0	−1.4	97.3	July 13	7.0	Jan. 16	57.6	+ 4.6	109
Corpus Christi	69.2	−1.0	91.7	Aug. 30	15.7	Jan. 15	48.2	.....	.....
Galveston	69.3	−0.9	93.5	Aug. 1	23.0	Jan. 16	66.0	+14.3	128
Palestine	65.0	−0.6	95.2	Aug. 2	3.7	Jan. 15	59.7	+ 8.1	119
San Antonio	67.6	−0.9	99.4	Aug. 7	11.4	Jan. 15	40.6	+10.1	133
Rio Grande Valley.									
Rio Grande City	73.1	−1.2	104.4	Aug. 19	21.0	Jan. 15	22.7	− 1.1	95
Brownsville	73.0	+0.2	97.2	Aug. 19	21.4	Jan. 16	32.6	− 4.8	87
Ohio Valley & Tenn.									
Chattanooga	60.5	+0.1	97.6	Aug. 7	10.1	Feb. 28	54.9	− 3.5	94
Knoxville	58.4	0.0	96.0	Aug. 3	9.1	Feb. 28	53.0	− 0.7	99
Memphis	60.8	+0.8	98.9	Aug. 2	6.2	Jan. 16	46.8	− 7.5	86
Nashville	58.6	−0.7	98.0	Aug. 3	2.0	Jan. 16	50.5	− 1.6	97
Louisville	56.2	−1.1	98.5	June 19, Aug. 1	7.9	Jan. 16	47.8	+ 0.1	100
Indianapolis	51.6	−0.8	97.5	Aug. 2	− 6.0	Jan. 16	41.4	− 3.8	92
Cincinnati	53.8	−1.7	97.4	Aug. 3	5.6	Feb. 27	34.9	− 7.0	83

Annual summary of Signal Service observations—Continued.

Stations and districts.	Temperature—degrees Fahrenheit.						Precipitation in inches.		
	Mean for 1888.	Departure from normal.	Extremes for 1888. Max.	Date of max.	Min.	Date of min.	Total for 1888.	Departure from normal.	Percentage of normal.
Columbus	51.0	−1.2	97.4	June 20	2.2	Jan. 28	35.1	+ 5.9	86
Pittsburgh	51.8	+1.5	95.2	June 20	1.1	Feb. 10	39.9	+ 2.9	107
Lower lake region.									
Buffalo	44.8	−1.4	86.0	June 20	− 8.0	Feb. 9–10	33.9	− 4.1	89
Oswego	43.2	−3.2	88.6	July 4	−10.0	Feb. 10	32.8	− 2.0	94
Rochester	44.9	−1.8	94.9	June 23	− 8.0	Feb. 10	27.8	− 7.4	82
Erie	47.0	−1.9	88.0	Aug. 3	− 8.0	Feb. 10	31.9	−11.3	74
Cleveland	48.2	−0.4	94.2	Aug. 3	− 3.1	Feb. 10	32.6	− 4.8	87
Sandusky	48.4	−1.6	95.2	Aug. 3	− 3.0	Feb. 15	26.4	−11.1	70
Toledo	47.6	−2.1	95.0	June 17	− 6.5	Feb. 9	25.9	− 6.8	79
Detroit	46.3	−2.7	94.5	June 17	− 7.0	Feb. 15	29.0	− 4.6	86
Upper lake region.									
Alpena	39.6	−1.1	90.0	Aug. 3, 25	−23.3	Feb. 10	29.4	− 8.5	78
Grand Haven	43.8	−2.5	90.5	June 18	− 7.0	Feb. 9	26.0	−12.7	67
Lansing	44.8	.....	95.8	June 17, 20	−11.8	Feb. 9	27.1	− 4.4	86
Marquette	37.9	−2.0	93.6	June 16	−36.6	Feb. 9	35.5	+ 2.9	109
Port Huron	44.0	−0.8	93.0	June 17	−12.6	Feb. 9	24.3	− 9.2	70
Chicago	46.6	−2.1	94.3	July 31	−17.5	Feb. 9	30.9	− 5.7	82
Milwaukee	43.4	−1.7	90.8	July 11	−22.7	Jan. 21	23.5	− 9.9	70
Green Bay	41.2	.....	92.0	June 17	−36.4	Jan 21	35.5	+ 2.9	109
Duluth	37.8	−0.8	95.2	Aug. 25	−34.0	Jan. 15	27.3	− 4.5	83
Extreme Northwest.									
Moorhead	36.6	−0.4	98.0	June 16	−47.0	Feb. 9	16.5	−10.4	61
Saint Vincent	33.2	−0.2	96.3	Aug. 23	−53.5	Jan. 11	17.2	+ 0.4	102
Bismarck	38.5	−1.0	97.8	Aug. 27	−37.0	Jan. 14	16.5	− 3.3	83
Fort Buford	38.4	−1.4	99.5	June 18	−49.2	Jan. 9	14.7	+ 0.4	103
Fort Totten	34.8	−0.7	94.2	Aug. 23	−41.5	Feb. 9	16.1	− 1.3	93
Up. Mississippi valley.									
Saint Paul	41.2	−2.8	94.0	July 11 / Aug. 2	−41.2	Jan. 21	25.9	− 2.7	91
La Crosse	44.0	−3.0	91.3	Aug. 2	−42.0	Jan. 21	34.8	+ 2.6	108
Davenport	47.2	−2.1	95.4	July 31	−24.5	Jan. 15	40.5	+ 5.6	116
Des Moines	47.0	−1.9	99.0	July 31	−27.4	Jan. 15	31.2	− 7.1	82
Dubuque	45.5	−1.9	96.0	Aug. 2	−30.5	Jan. 16	33.3	− 5.2	86
Keokuk	49.8	−1.7	96.3	July 31	−23.0	Jan. 15	35.8	− 0.9	97
Cairo	56.7	−1.0	97.0	Aug. 2	− 0.3	Jan. 16	41.9	− 2.1	95
Springfield, Ill.	50.2	−2.9	97.1	July 31	−17.0	Jan. 15	40.8	− 0.8	98
Saint Louis	54.6	−1.7	97.9	July 31	−11.5	Jan. 15	41.2	+ 2.6	107
Missouri Valley.									
Springfield, Mo.	54.9	.....	99.0	July 31	−11.0	Jan. 15	42.1	.....	....
Leavenworth	52.6	−0.9	97.0	July 30	−21.1	Jan. 15	47.2	+ 9.1	124
Topeka	51.8	.....	99.8	Aug. 30 / Sept. 3	−19.5	Jan. 15	34.0	.....	....
Omaha	48.8	−0.8	101.2	July 30	−25.2	Jan. 15	24.2	−10.8	69
Crete	48.8	.....	99.6	July 12	−28.2	Jan. 15	23.3	.....	....
Valentine	43.3	.....	102.9	July 11	−34.6	Jan. 15	22.0	.....	....
Fort Sully	43.8	.....	103.8	July 11	−31.7	Jan. 16	14.8	− 1.2	92
Huron	41.4	−1.6	101.7	July 11	−36.0	Jan. 15	17.0	− 7.0	71
Yankton	45.6	−0.6	101.8	July 30	−27.5	Jan. 13	20.9	− 7.4	74
Northern slope.									
Fort Assiniboine	41.1	+0.8	102.0	July 10	−38.0	Jan. 6, 21	14.0	− 3.8	83
Fort Custer	43.5	−1.5	102.9	July 10	−45.1	Jan. 14	14.0	+ 0.9	107
Fort Maginnis	42.5	+0.4	94.0	July 10	−39.2	Jan. 13	25.7	+10.2	166
Helena	43.4	+0.4	99.1	July 10	−41.0	Jan. 15	10.1	− 4.4	69
Poplar River	37.3	−1.2	101.3	June 18	−56.8	Jan. 9	13.4	+ 3.1	130
Rapid City	45.2	.....	100.0	July 10	−29.7	Jan. 14	22.8	.....	....
Cheyenne	45.6	+0.7	97.2	July 11	−27.2	Jan. 14	14.5	+ 3.1	127
North Platte	47.9	−1.0	101.2	July 5	−34.6	Jan. 15	17.5	− 1.7	91
Fort McKinney	44.4	.....	95.0	July 10	−36.0	Jan. 14	18.3	.....	....
Fort Washakie	42.4	.....	99.0	July 11	−42.0	Jan. 14, 15	13.3	.....	....
Middle slope.									
Colorado Springs	48.8	.....	96.4	July 12	−23.0	Jan. 15	9.1	.....	....
Denver	50.5	+0.7	100.3	July 11	−20.3	Jan. 15	9.5	− 5.4	63
Concordia	51.8	+0.3	103.0	July 20	−25.3	Jan. 15	23.2	− 3.6	86
Dodge City	54.1	+1.0	103.5	Aug. 14	−18.0	Jan. 15	22.9	+ 2.1	111
Fort Elliott	56.0	−1.0	104.1	Aug. 5	−14.2	Jan. 15	16.5	− 9.2	64
Southern slope.									
Fort Sill	59.2	−1.4	105.0	Aug. 6	− 7.2	Jan. 15	35.7	+ 3.8	112
Abilene	62.8	−1.8	103.0	Aug. 7	− 5.0	Jan. 15	30.6	+ 1.9	107
Fort Davis	60.0	−0.7	97.0	Aug. 6	0.0	Jan. 15	18.1	− 0.3	93
Fort Stanton	50.8	.....	92.5	June 28	− 3.0	Jan. 15	18.0	+ 0.4	103
Southern plateau.									
El Paso	64.1	+0.1	101.8	Aug. 8	12.8	Jan. 15	9.8	− 1.4	87
Fort Grant	61.1	+0.4	97.6	July 8	19.2	Jan. 1	14.2	− 2.8	84
Whipple Barracks	53.3	+0.8	96.1	July 15	−12.0	Jan. 8	18.5	+ 2.6	116
Yuma	72.3	+0.4	113.7	July 22	27.0	Jan. 11	3.0	+ 0.1	103
Keeler	61.2	+0.3	99.8	Aug. 25	11.8	Jan. 15	5.7	+ 2.2	163
Middle plateau.									
Winnemucca	49.8	+1.0	96.0	July 20	−28.0	Jan. 15	4.9	− 4.6	52
Salt Lake City	53.0	+1.9	98.2	Aug. 26	−16.7	Jan. 15	13.6	− 3.3	80
Montrose	49.0	+0.1	97.0	July 5	−30.0	Jan. 17	8.5	− 1.3	87
Carson City	50.6	.....	94.4	July 16	− 9.6	Jan. 16	6.6	.....	....
Fort DuChesne	45.4	.....	101.7	July 10	−37.6	Jan. 15	6.5	.....	....
Northern plateau.									
Boisé City	51.8	+1.2	102.6	Aug. 23	−27.8	Jan. 16	11.1	− 2.6	81
Spokane Falls	49.0	+1.6	101.8	Aug. 22	−30.5	Jan. 16	17.7	− 1.6	92
Walla Walla	54.2	.....	102.4	July 18 / Aug. 21	−17.1	Jan. 16	13.6	− 4.7	74
N. Pacific coast region.									
Fort Canby	51.0	−0.2	83.5	Sept. 25	11.0	Jan. 15	59.8	− 1.0	98
Olympia	51.2	+1.4	92.0	July 17	− 1.8	Jan. 15	45.5	− 9.1	83
Port Angeles	47.0	+0.8	79.0	Aug. 30	6.3	Jan. 14	28.2	− 1.6	95
Tatoosh Island	49.5	+0.8	71.7	May 15	14.0	Jan. 13	83.7	−10.9	88
Portland	53.8	+0.8	97.0	July 17	− 2.0	Jan. 15	38.8	−12.8	75
Roseburgh	54.8	+1.9	100.0	July 17	− 6.0	Jan. 16	31.2	− 4.1	88
M. Pacific coast region.									
Eureka	53.0	.....	76.9	Jan. 26	20.3	Jan. 14	36.5	.....	....
Red Bluff	63.6	+1.5	109.0	July 20, 21	17.5	Jan. 14	24.9	− 0.9	96
Sacramento	61.4	+1.4	107.5	Aug. 24	19.0	Jan. 14, 15	18.5	− 3.2	85
San Francisco	57.3	+0.6	93.4	July 15	28.7	Jan. 15	23.0	− 0.5	98
S. Pacific coast region.									
Fresno	64.4	.....	111.1	Aug. 24	19.6	Jan. 16	8.8	.....	....
Los Angeles	63.2	+1.0	99.0	Apr. 13	30.9	Jan. 10	21.0	+ 3.8	122
San Diego	61.0	+1.0	93.0	Apr. 12	33.0	Jan. 8	11.6	+ 0.8	107

The following table shows the normal and current annual mean temperatures and rainfalls, departures, and extremes for past years, as reported by voluntary observers:

Annual Summary for 1888.—*Voluntary Stations.*

Stations.	Temperature. Normal.	Length of record.	Mean for 1888.	Departure.	Highest mean. Degrees.	Highest mean. Year.	Lowest mean. Degrees.	Lowest mean. Year.	Precipitation. Normal.	Length of record.	Total for 1888.	Departure.	Greatest. Amount.	Greatest. Year.	Least. Amount.	Least. Year.
California.																
Sacramento	60.3	30	57.7	−2.6	62.8	1864	57.2	1880	19.00	38	21.06	+ 2.06	32.19	1884	8.44	1877
Georgia.																
Forsyth	65.2	14	65.6	+0.4	67.0	1880	62.6	1885	51.23	14	63.43	+12.20	65.64	1882	33.85	1878
Illinois.																
Peoria	52.2	32	51.4	−0.8	54.9	1878	49.5	1875	35.37	32	38.22	+ 2.85	53.35	1858	23.57	1870
Indiana.																
Vevay	54.9	16	53.9	−1.0	57.1	1882	51.8	1875	43.12	20	45.98	+ 2.86	60.35	1883	33.31	1877
Kansas.																
Lawrence	52.9	20	52.3	−0.6	55.3	1878	50.5	1869	34.66	20	44.17	+ 9.51	44.18	1876	24.25	1886
Maryland.																
McDonogh Ins.	51.9	12	51.4	−0.5	53.1	1878	50.6	1883	37.39	12	45.90	+ 8.51	45.90	1888	31.55	1879
Massachusetts.																
Amherst	46.8	52	44.0	−2.8	49.8	1839	44.0	1888	43.84	50	58.04	+14.20	58.82	1877	20.37	1884
Somerset	50.0	14	48.6	−1.4	50.8	1877	46.3	1875	45.25	14	53.51	+ 8.26	53.51	1888	35.73	1885
Westborough	48.3	13	48.0	−0.3	50.1	1887	46.2	1875	43.14	12	53.50	+10.36	58.04	1884	33.61	1883
Nebraska.																
De Soto	47.8	21	47.4	−0.4	51.0	1878	43.8	1875	32.61	16	32.27	− 0.34	47.49	1869	19.94	1887
Genoa	46.8	12	46.5	−0.3	49.3	1878	44.0	1884	27.68	12	29.30	+ 1.62	34.90	1876	16.93	1879
New Jersey.																
Moorestown	51.4	14	50.2	−1.2	52.7	1880	49.6	1885	41.75	*9	49.37	+ 7.62	49.56	1882	36.03	1879 1880
New York.																
Ardenia	49.6	19	48.7	−0.9	52.6	1877	46.9	1856	40.68	12	50.91	+10.23	50.91	1888	30.80	1880
Cooperstown	43.8	34	42.3	−1.5	46.9	1870	41.5	1875	37.51	34	38.45	+ 0.94	48.12	1855	30.19	1879
Palermo	44.1	28	42.6	−1.5	47.8	1878	41.0	1885	37.30	34	31.78	− 5.52	51.30	1859	24.19	1884
Ohio.																
College Hill	53.0	62	53.8	+0.8	56.9	1881	48.6	1831	47.91	21	62.56	+14.65	72.08	1880	31.50	1877
Oregon.																
Eola	51.0	14	52.0	+1.0	53.7	1874	48.8	1880	39.32	13	39.80	+ 0.48	50.12	1877	30.71	1874
Pennsylvania.																
Blooming G've	46.3	20	47.2	+0.9	49.8	1884	43.6	1868	40.75	20	59.10	+18.35	59.10	1888	24.00	1876
Tennessee.																
Austin	59.6	16	59.5	−0.1	61.4	1881	57.5	1883	52.37	12	42.58	− 9.79	73.37	1882	38.09	1885
Vermont.																
Lunenburgh	41.6	40	41.3	−0.3	44.8	1864	37.7	1875	39.58	40	43.58	+ 4.00	60.91	1872	31.14	1880
Strafford	43.6	15	41.9	−1.7	45.2	1877	40.8	1875	39.06	14	47.85	+ 8.77	48.45	1876	28.94	1882
Virginia.																
Bird's Nest	58.3	20	55.9	−2.4	61.3	1880	55.3	1872	44.51	19	48.06	− 3.55	56.30	1875	33.37	1870

* Normal for 9 years.

The following notes of the meteorological features of the year have been furnished by the directors of the several state weather services and voluntary observers:

Alabama.—The warm days in the latter part of February brought forth the fruit blossoms earlier than usual. March was cold and unpropitious to farming operations. The remainder of the spring was mild and pleasant and favorable for the rapid development of tender plants. The summer opened with a drought that seriously injured upland corn in middle Alabama. Rains became quite frequent toward the close of summer, causing cotton to sprout in the field and intensifying the tendency to rust. The precipitation was unusually large in August. The last killing frost in spring was on the 25th of April, and the first killing frost of autumn the 26th of November.—*Report of Alabama State Weather Service.*

Arkansas.—The rains were generally distributed very favorably throughout the year, crops seldom being injured and never destroyed, either by drought or flood.—*Report of Arkansas State Weather Service.*

Illinois.—The year was an unusual one, as regards the effects of its rainfall and temperature on agricultural products, which were eminently favorable.—*Report of Illinois State Weather Service.*

Indiana.—The year was cool and moderately wet; the total amount of precipitation being above the normal, except in the northern portion of the state, where it was deficient. The temperature was below the normal during all the seasons.—*Report of Indiana State Weather Service.*

Iowa.—The weather for the year was favorable for the production of good crops, and the harvest season was fine. While the cold of the early months was far in excess of the normal allowance, the closing months of the year were extraordinarily fair, warm, and pleasant. No tornado occurred during the year.—*Report of Iowa Weather Service.*

Kansas.—The rainfall in the eastern part of the state was slightly greater than in 1887. July was a dry month, and many complaints were made of blighted crops, but the cause was not wholly a dearth of rain. In August and September there was an abundance of rain. The hot winds of July, sweeping from the southwest corner up through the middle of the state, contributed more to the failure of crops than did the lack of moisture in the soil.—*Report of Kansas State Weather Service.*

Louisiana.—The average temperature was 0°.1 above, and the average precipitation was 6.74 inches below the twenty-year normal. Snow fell in a measurable quantity on two dates in January in several of the extreme northern parishes.—*Report of the Louisiana State Weather Service.*

Minnesota.—As compared with the three preceding years there was a deficiency of about 2° in temperature, and an excess of about three inches in precipitation. The latest frost of spring occurred at Saint Vincent, June 6th, and the first frost of fall was noted at Saint Vincent and Grand Forks, Dak., August 9th. This early frost damaged the wheat and other crops in northern Minnesota and Dakota.—*Report of the Minnesota State Weather Service.*

Nebraska.—The temperature was nearly normal, but the extremes in temperature were unusually great. The precipitation averaged somewhat below the normal, but had a wide range, varying from about fifteen inches in the southwestern part of the state to over thirty-three inches in the southeastern. *Report of the Nebraska State Weather Service.*

California.—Lewis Creek, Tulare Co.: January very frosty and cold. All the lemons on the place were killed. April was the driest known for years. In November and December there was an unusual amount of fog.—*Report of voluntary observer.*

Oroville, Butte Co.: the cold-wave that passed over the state in January was the longest continuous spell of cold weather and marked the lowest temperatures of any period since 1849. It began on the 4th, and the temperature was below 32° for fourteen days with but one exception. Commencing on the 19th of August and ending September 12th, was the longest continuous spell of hot weather I have ever experienced.—*Report of voluntary observer.*

Florida.—Manatee, Manatee Co.: light frost January 19th and 30th, and general frost November 26th, December 21st and 22d, none of which were damaging.—*Report of voluntary observer.*

Massachusetts.—Blue Hill, Norfolk Co.: the noteworthy phenomena during the year were the exceptionally cold January (7° below normal), the very cool July and October, the heavy rainfall during the autumn, and the severe and destructive storms of March 11–13th and November 25–26th.—*Report of voluntary observer.*

New Hampshire.—Concord: the total precipitation of the year exceeded the average of the preceding thirty-two years by 14.12 inches, and has only been exceeded once, in 1863.—*Report of voluntary observer.*

OCEAN FOG DURING 1888.

The following table shows the number of days in each month for which fog was reported on the north Atlantic Ocean west of the fortieth meridian during 1888:

Month.	Between W. 40° and 55°.	Between W. 55° and 65°.	West of 65°.
January	8	2	7
February	17	8	11
March	16	6	6
April	22	6	13
May	17	10	21
June	23	12	18
July	28	13	13
August	26	13	9
September	16	12	11
October	11	2	5
November	6	7	7
December	9	4	3
Totals	199	95	124

From the above it will be seen that in the vicinity of the Banks of Newfoundland fog was most frequently reported during the summer months, the greatest number of foggy days in any month (28) being noted in July. From this time there was a gradual decrease in fog-frequency until December. In the vicinity and to the southward of Sable Island and Sable Island Bank the period of greatest fog-frequency corresponded with that of the Grand Banks, although the aggregate number of foggy days during the year was more than 50 per cent. less. Over and near George's and Nantucket Shoals, and off the coast of the United States to the southward, the month of greatest fog-frequency was May, when its occurrence was reported on twenty-one days, from which time there was a gradual monthly decrease in the number of foggy days until December.

The more frequent occurrence of fog near Newfoundland during the spring and summer months is attributed to the presence in that locality during those seasons of extensive fields of Arctic ice which commence to drift southward in the Labrador current during the early spring months. As the season advances the ice massed along the Labrador and more northern coasts breaks away in larger quantities, and during the late spring and early summer months there is an immense accumulation of field ice and icebergs off Newfoundland and over the Grand Banks. In succeeding numbers of the REVIEW during the past two years the subject of ocean fog has been made a feature. It has been shown that its development near Newfoundland is incidental to a shift of wind to southerly or southeasterly with the approach or passage of areas of low barometric pressure, and that the more frequent and denser development of fog during the ice season is apparently due to the more marked differences in the temperature of air drawn by southerly winds from over the ocean to the southward and the Gulf Stream and the air which immediately overlies the cold surface of the ice fields. The gradual decrease in the quantity of ice in that region is attended by a diminution in fog-frequency until the months of November, December, and January, when the southward movement of Arctic ice has ceased, and the occasional development of fog is apparently dependent upon the contrasts in temperature occasioned by the warm Gulf Stream and the cold Arctic current which meet in that locality.

Between the fifty-fifth and sixty-fifth meridians the season of greatest fog-frequency extended from May to September, inclusive; it occurred on the greatest number of days (thirteen) in July and August, respectively, and upon the least number of days (two) in January. In this region fog is generally encountered with east to south winds occasioned by the approach or passage to the northward of areas of low barometric pressure, and its development apparently depends largely upon the contrasts in temperature which exist between the warm, moist air drawn from over the Gulf Stream and that which overlies Sable Island Bank, where the deep-flowing cold waters of the Arctic current are forced to the surface. To the westward of the sixty-fifth meridian the season of greatest fog-frequency was somewhat earlier than in the other regions referred to, and extended from April to July, inclusive; the greatest number of foggy days (twenty-one) being shown in May, and the least (three) in December. In this, as in the fog districts to the eastward, there is an apparent relation between the development of fog and the meeting of masses of warm, vapor-laden air drawn from over the Gulf Stream by the cyclonic circulation of winds in the eastern quadrants of areas of low pressure which advance from the continent north of the fortieth parallel, and the colder air which overlies the waters on George's and Nantucket shoals, where, as over Sable Island Bank, is found a similar forcing to the surface of the cold, deep-flowing waters of the Arctic current. If, as it appears, fog-development is occasioned by the meeting of warm, humid air from the Gulf Stream, and cold air overlying the ice fields, and the banks and shoals of the Arctic current, and, in instances, the cold air flowing from the continent, it would seem to follow that the months in which these contrasts in temperature were more marked would be the months of greatest fog-frequency. In the case of the fog of the Newfoundland Banks, it has been shown that these differences are more marked during the ice season, and that this season corresponds with that of the greatest fog-frequency. As regards the more westerly districts, it is assumed that while the absolute differences in temperature during the spring and summer months are not equal to those which exist in winter, the greater capacity of the sea air for moisture, and the fact that it is more nearly saturated in the summer season, renders it more susceptible to the influence of cooler air, as regards the precipitation of its aqueous vapor, and the contrasts in temperature with the air over the cold coast current, or its banks and shoals, need not necessarily be so great in order to cause a condensation of fog particles.

Since September, 1886, there have been printed in the MONTHLY WEATHER REVIEW from time to time special articles giving general conclusions in connection with the subject, and intimating the practicability of making forecasts of the probable dates on which fog would occur along the trans-Atlantic steamship routes and off the Maritime States and Provinces. The importance now attached to this work is indicated by the following extract taken from "Nautical Monograms, No. 5," prepared by Mr. Everett Hayden, in charge of the division of marine meteorology, Hydrographic Office, United States Navy, and issued in January, 1889: "Scientific research and practical inventive genius, advancing hand in hand for the benefit

of mankind, have discovered not only the laws governing the formation of the dense banks of fog that have made the Grand Banks dreaded by navigators, but also the means by which certain facts may be observed, telegraphed, charted, and studied a thousand miles away, and the occurrence of fog predicted with almost unfailing accuracy, even whilst the very elements themselves are only preparing for its formation. By means of such predictions the safety of navigation along the greatest highway of ocean traffic in the world would be vastly increased—routes traversed yearly, at almost railroad speed, by vessels intrusted with more than a million of lives and property of an aggregate value of fully a billion dollars."

As the principal fog-belts of the north Atlantic extend along or near the trans-Atlantic steamship tracks, and reports have been contributed monthly by hundreds of shipmasters, there is now available a large amount of data bearing upon this subject, from which an exhaustive study of the more detailed meteorological conditions attending fog formation over the ocean could be made. It has been possible thus far to determine the general meteorological features that have preceded fog along the steamship routes west of the fortieth meridian, and to deduce certain conclusions as to the relations which appear to exist between the storms which advance from the American continent and the development of fog in those regions. While these general conclusions seem to admit of the successful forecasting of fog, they do not satisfactorily explain those exceptional cases wherein the conditions apparently favor fog development, and no fog occurs, and those in which fog does occur in the absence of well-defined favorable conditions. While these instances are not of common occurrence, and would not probably seriously reduce the percentage of verifications of predictions based upon the general laws of fog formation, they constitute a feature, which, while apparently due to insufficient or excessive differences in temperature or humidity, as applicable to the one or the other of the instances cited, require, for a more satisfactory solution, a more detailed investigation of the subject than has heretofore been afforded it.

Precipitation (in inches and hundredths) furnished (with notes) by Thomas R. Rodman, voluntary observer, New Bedford, Mass.

NOTE.—Observations were commenced by Mr. Samuel Rodman in October, 1813, at New Bedford, Mass. The station was located at the corner of Water and William streets about 200 feet from, and at an estimated elevation of the gauge of about 15 feet above, the tide water of the Acushnet River.

On the 24th of January, 1820, the location of his meteorological observations was changed to his residence on Middle street, just west of the projection of Water street, about 400 feet north of the place of his first observations, about 100 feet from, and about 10 feet above, the same tide water.

On the 19th of January, 1828, the location of his observations was again changed to his new residence, corner of Spring and County streets, about one-half mile southwest of the Middle street house, about three-eighths of a mile from, and about 100 feet above, the same tide water. Here the record has been kept continuously since.

In this last locality the position of the gauge was about 50 feet south of the house.

In 1880 the gauges were removed to a point about 25 feet to the northeast, and a little later they were removed about 25 feet farther in the same direction; and here, since some date in 1882, as I estimate, they have stood until the present time.

The elevation of the ground on which they now stand is about 92 feet above tide water, about 50 feet southeast of the three story house, about 50 feet north of Grace Church, and about 15 feet southwest of the "L" of the house of William N. Church. The tops of the gauges are 31 inches above the ground.

Care has been taken to remove the gauges so far as practicable, from all disturbing influences.

The first gauge used by my father was made of tin and I still record the measurements of such a one, though not the identical instrument used in his first observations, as I found the following note made January, 1859, when he began to use other gauges: "The same instrument has not been used the whole of that early period (1813—1859) several having been stolen or destroyed." The present tin cone, which I judge is constructed upon the lines of its predecessors, has an internal depth of 14 inches, which includes a section of a cylinder 2 inches deep. Its diameter at widest part is 6 inches.

I do not know whence or how my father arrived at those proportions, but he became dissatisfied subsequently with the accuracy of the tin gauge and in January, 1859, procured of Mr. Edward S. Richie, a mathematical instrument maker of Boston, and of high repute in his profession, as elsewhere, another gauge made of copper, but designated as the "Brass Cone." This cone is of the same measurements as the tin cone, except that its greatest diameter is 5¾ inches. Within a few years the Brass or Richie Cone was tested by Mr. Lawrence Roch of the Blue Hill Observatory, Mass., and found to be accurate. Its correctness has also been established by Mr. Robert P. Coggeshall, superintendent of the New Bedford Water-Works, in behalf of the New England Meteorological Society.

About the same time my father received from the Smithsonian Institute, Washington, another gauge.

Since or beginning with January, 1859, the record of the three gauges has been kept, and the following results were reached by my father after seven years comparison.

There was a remarkable almost absolute correspondence between the Brass Cone and the Smithsonian, and it was found that their registry was about one eighth in excess of that of the tin cone.

In making up the table of rainfall for seventy-five years, which I sent you, the addition of one-eighth has been made for the period from 1814 to 1859, inclusive, when the tin cone only was used.

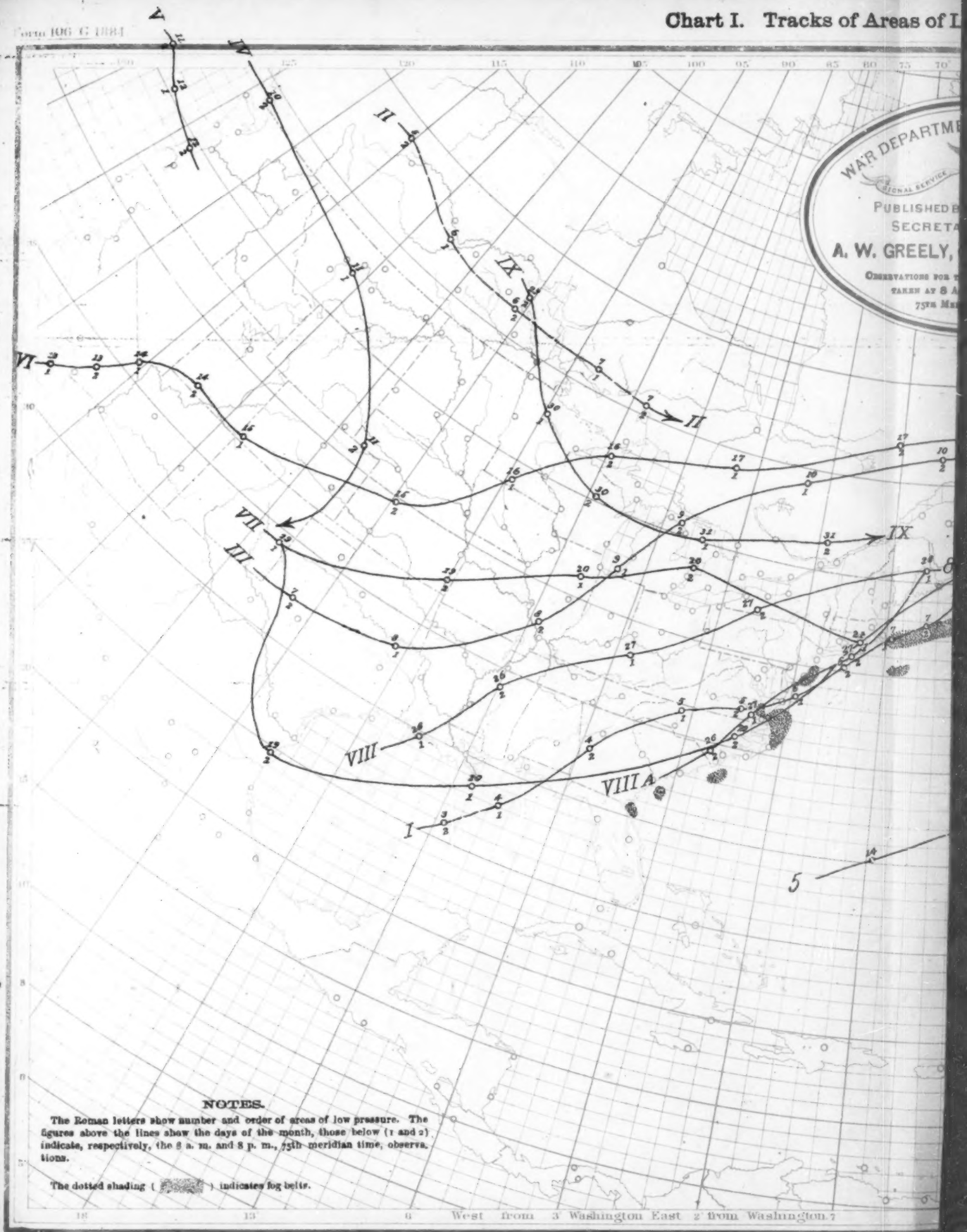
Practically speaking, all the records of the rainfall from October, 1813, to July 28, 1876, inclusive, were made by my father. I have taken up the work where he left it, and almost without assistance have carried it on since. I should state that the table gives the record of the Brass or Ritchie cone.

I must here record my obligations to Mr. Coggeshall, aforesaid, under whose faithful and intelligent supervision the tables were prepared.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1814 ...	1.42	8.30	2.16	5.46	4.23	2.27	0.99	6.44	3.06	1.73	5.37	1.65	43.08
1815 ...	4.55	3.32	5.02	4.66	4.11	2.22	1.96	4.36	2.51	1.47	3.45	3.15	40.78
1816 ...	2.12	6.82	2.47	5.50	6.15	2.33	1.01	1.46	6.05	3.96	5.56	0.70	44.13
1817 ...	3.96	5.26	1.77	2.60	1.19	7.00	0.88	3.21	4.09	1.19	6.64	5.54	43.33
1818 ...	3.31	0.91	3.31	3.94	6.79	3.51	3.32	1.66	5.52	2.84	3.35	2.31	40.77
1819 ...	1.25	2.54	7.30	3.31	2.06	3.32	1.57	6.00	4.81	3.84	1.92	1.74	39.66
1820 ...	1.46	5.02	4.44	1.23	5.41	0.46	3.71	4.38	2.01	6.22	3.75	3.23	41.32
1821 ...	2.32	5.96	2.52	6.09	5.42	3.78	2.41	2.23	4.11	4.96	2.94	2.90	45.64
1822 ...	3.29	3.70	3.31	4.76	0.58	2.58	5.14	3.51	6.05	2.97	3.62	2.27	41.78
1823 ...	4.84	5.00	8.43	1.83	7.67	3.20	4.63	3.90	2.08	5.06	3.51	9.74	59.89
1824 ...	3.84	5.32	3.61	5.74	2.68	3.14	2.44	6.21	4.88	2.55	3.54	3.39	47.34
1825 ...	2.80	2.21	6.06	1.42	2.11	3.71	2.06	3.52	1.68	2.78	1.81	7.93	38.09
1826 ...	2.19	3.85	4.08	2.92	0.73	2.11	2.44	18.72	1.44	7.47	4.50	4.32	54.77
1827 ...	3.14	3.99	4.88	3.46	6.94	4.42	4.36	7.63	5.65	6.68	7.42	3.33	62.90
1828 ...	3.02	3.25	4.31	3.48	3.91	4.04	3.02	1.15	3.63	3.62	5.16	0.45	39.04
1829 ...	9.06	5.76	7.03	4.79	8.59	2.92	3.40	7.53	3.49	3.53	7.18	2.13	65.41
1830 ...	4.20	3.07	4.77	2.25	6.63	3.71	12.00	6.22	5.20	3.54	6.18	6.89	64.66
1831 ...	7.47	3.53	5.24	7.36	4.45	3.52	7.26	3.32	5.86	6.04	3.68	3.43	61.18
1832 ...	3.98	5.36	3.02	3.41	6.55	0.41	1.69	8.30	3.00	2.64	4.43	0.52	49.31
1833 ...	3.91	2.37	1.92	2.31	4.14	4.25	1.38	2.57	1.88	5.70	5.51	6.68	42.62
1834 ...	2.76	1.61	1.95	2.94	4.74	7.30	3.42	1.81	5.63	5.25	4.23	3.48	45.12
1835 ...	3.35	1.80	6.52	6.84	2.65	2.52	1.56	10.16	0.90	2.99	2.97	4.95	47.21
1836 ...	9.53	4.62	3.78	2.78	1.76	4.93	1.90	1.12	1.28	2.58	4.53	4.02	42.83
1837 ...	3.69	3.75	4.47	3.33	6.47	4.41	2.15	4.37	0.54	1.34	1.50	3.05	39.07
1838 ...	3.00	2.41	2.90	2.15	3.02	2.84	1.55	2.99	6.71	5.38	4.36	0.97	38.28
1839 ...	0.77	2.71	2.44	4.83	4.96	2.51	2.76	5.89	3.38	5.86	2.01	6.26	44.38
1840 ...	3.25	2.68	3.99	4.56	5.82	3.69	2.14	2.88	3.07	0.93	7.52	3.06	49.59
1841 ...	5.57	1.75	4.06	9.27	1.66	1.44	3.05	5.05	2.90	4.70	5.30	5.85	50.60
1842 ...	2.47	4.34	2.89	3.77	3.17	7.40	1.34	1.97	2.00	0.86	3.06	5.79	39.06
1843 ...	3.54	4.18	4.02	6.19	1.39	1.45	3.31	7.13	1.77	6.86	5.09	5.34	50.67
1844 ...	4.19	2.18	6.65	1.79	2.60	0.90	3.08	2.49	4.15	4.56	4.01	4.13	40.73
1845 ...	4.16	3.00	3.04	1.87	3.79	2.34	3.09	3.37	4.49	4.29	9.72	4.90	48.06
1846 ...	3.09	2.57	1.74	1.20	6.40	0.99	2.61	3.07	2.48	1.68	3.80	4.88	34.51
1847 ...	3.33	4.57	3.25	1.66	2.64	6.46	2.41	7.15	7.20	0.62	1.52	5.10	45.91
1848 ...	3.75	4.22	2.89	1.46	3.88	2.99	4.04	1.16	1.89	5.43	3.30	5.73	40.74
1849 ...	0.88	2.07	5.70	2.23	2.43	1.59	1.22	4.88	1.24	5.71	5.15	3.32	36.42
1850 ...	5.87	2.22	6.05	9.25	4.49	1.23	2.26	6.29	12.06	2.62	2.82	7.51	62.67
1851 ...	2.42	6.20	3.27	4.84	4.78	1.18	9.22	3.49	3.75	5.37	4.76	2.51	51.61
1852 ...	3.91	3.57	5.50	7.86	3.50	1.71	2.55	5.49	2.01	2.03	3.66	4.35	46.14
1853 ...	1.69	4.67	1.28	3.92	4.36	0.92	3.95	2.95	3.84	3.52	3.92	4.45	39.47
1854 ...	1.99	5.67	2.15	6.83	3.56	3.02	7.44	0.24	8.37	1.48	9.66	3.40	53.82
1855 ...	4.72	2.62	1.95	4.24	3.64	1.84	4.79	1.42	0.62	4.66	4.82	5.68	41.00
1856 ...	5.18	1.27	1.64	3.30	3.96	2.12	3.32	2.81	4.56	1.89	3.26	3.88	37.09
1857 ...	6.20	1.84	3.52	5.90	3.69	2.30	4.62	3.94	2.32	2.64	1.84	5.49	43.30
1858 ...	2.46	1.28	2.28	4.39	2.02	5.16	6.75	5.05	3.02	3.20	3.84	4.58	44.03
1859 ...	8.53	4.40	6.64	3.44	5.14	6.16	0.96	4.02	3.64	2.07	2.10	4.34	51.43
1860 ...	1.37	3.50	2.82	2.86	2.80	3.26	2.96	5.00	5.24	1.82	3.44	4.65	39.73
1861 ...	4.19	3.25	4.06	5.44	4.42	3.12	1.70	5.00	3.50	4.30	4.58	2.90	46.46
1862 ...	3.27	3.88	2.80	1.66	2.86	8.05	3.06	1.20	3.98	5.62	4.47	2.46	43.32
1863 ...	2.75	4.16	4.26	4.34	3.52	2.49	4.26	2.51	2.50	1.90	7.03	5.37	45.10
1864 ...	4.35	1.51	5.52	3.10	2.93	1.08	1.50	7.68	2.28	2.35	4.18	4.48	40.96
1865 ...	5.51	3.92	4.90	3.34	6.36	1.66	5.15	1.21	0.26	4.93	4.47	4.40	46.01
1866 ...	2.30	4.54	3.70	2.06	4.15	4.18	1.86	3.60	5.32	2.64	2.65	3.31	40.30
1867 ...	2.84	5.08	5.58	3.18	3.85	2.36	6.03	5.70	2.44	3.96	1.99	4.10	47.11
1868 ...	6.17	2.43	4.64	5.96	9.42	6.51	3.78	4.50	5.91	1.66	2.98	2.34	56.32
1869 ...	3.97	5.34	6.22	1.42	5.92	4.45	1.62	2.76	2.62	6.75	2.30	6.56	49.94
1870 ...	6.20	4.55	3.46	6.20	3.50	3.62	3.05	1.69	1.28	6.64	3.28	3.70	47.16
1871 ...	3.26	3.28	4.86	3.93	2.68	5.39	1.92	6.35	2.24	6.38	6.98	2.34	49.60
1872 ...	2.64	2.42	5.33	2.27	3.51	2.68	6.40	4.04	4.58	5.79	3.58	4.42	47.66
1873 ...	7.24	4.93	2.89	3.98	4.95	1.44	1.22	4.16	3.17	5.34	6.32	6.06	51.70
1874 ...	4.27	4.27	1.59	8.57	5.11	3.70	3.84	7.66	2.94	0.55	3.49	3.34	49.34
1875 ...	3.78	3.67	7.86	4.04	4.20	4.98	4.00	4.60	2.38	3.02	4.86	0.94	48.33
1876 ...	1.02	4.85	5.54	3.85	1.68	0.73	3.86	1.23	4.40	1.52	8.42	5.09	42.18
1877 ...	3.06	1.79	9.42	3.13	2.92	2.36	4.93	3.39	0.83	7.66	6.60	0.95	47.04
1878 ...	5.97	4.05	4.77	4.94	2.91	2.97	2.36	5.38	1.04	5.93	5.74	4.49	50.56
1879 ...	3.42	3.00	5.56	5.12	1.83	2.78	3.59	4.37	3.18	1.19	3.55	4.72	42.31
1880 ...	2.06	2.97	4.85	3.49	1.37	1.96	6.59	5.62	1.68	3.11	2.44	3.92	40.07
1881 ...	4.14	5.83	4.74	1.79	2.39	5.14	1.65	0.79	3.29	1.52	5.78	2.04	39.10
1882 ...	4.14	6.23	2.48	4.06	4.74	1.70	1.52	0.89	6.26	4.00	1.91	3.45	41.38
1883 ...	4.73	4.67	2.08	2.93	3.60	1.46	6.92	0.85	2.74	6.36	3.28	3.89	43.51
1884 ...	4.85	5.72	5.29	5.17	3.33	5.38	4.80	8.49	0.98	1.63	3.55	5.80	54.99
1885 ...	5.29	2.76	1.49	2.66	3.15	4.06	1.17	4.23	1.85	4.04	3.16	3.04	36.81
1886 ...	0.77	7.05	5.09	2.19	4.39	1.99	2.69	2.76	2.15	4.23	3.76	6.78	49.85
1887 ...	6.02	6.25	5.83	5.45	2.24	3.13	3.61	6.68	1.71	3.95	2.60	4.28	51.77
1888 ...	4.38	2.63	5.66	2.42	5.57	1.45	5.17	4.89	9.52	2.66	7.39	3.33	55.07
Means.	3.90	3.82	4.17	3.96	3.95	3.13	3.36	4.28	3.48	3.93	4.31	4.11	46.31

Form 106 C 1884

Chart I. Tracks of Areas of L



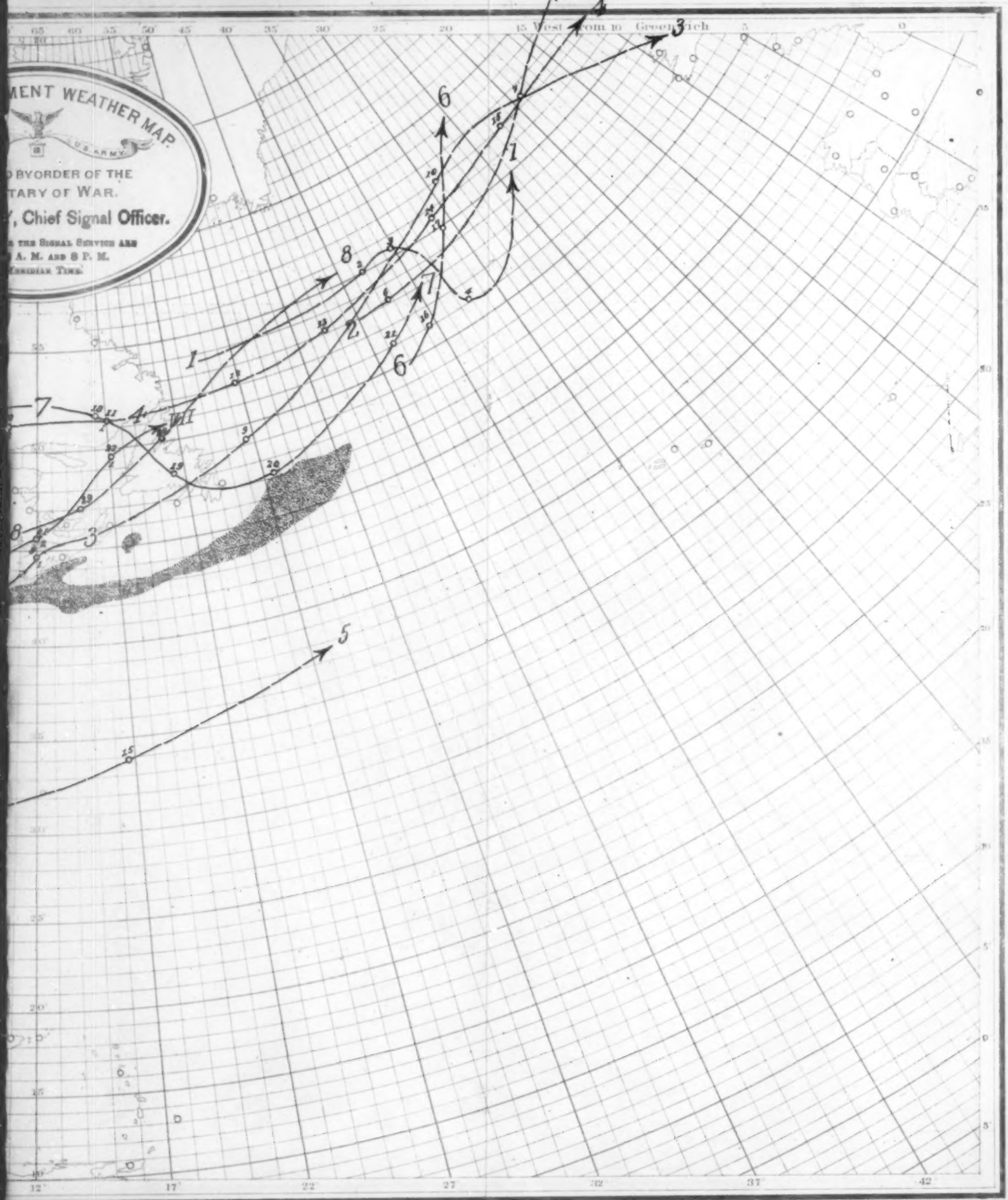
NOTES.

The Roman letters show number and order of areas of low pressure. The figures above the lines show the days of the month, those below (1 and 2) indicate, respectively, the 8 a. m. and 8 p. m., 75th meridian time, observations.

The dotted shading ( ) indicates fog belts.

West from 3 Washington East 2 from Washington.

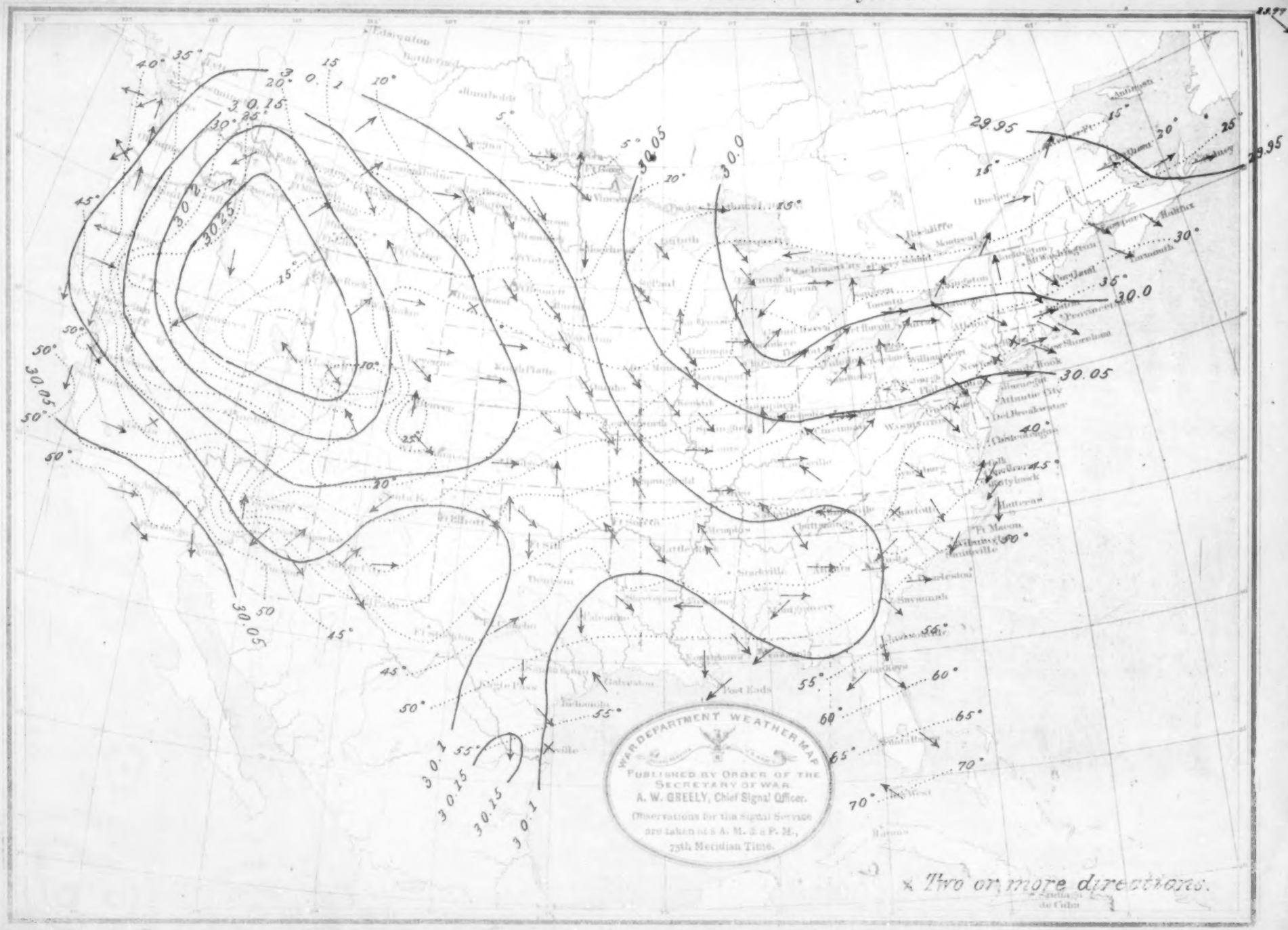
Low Pressure. January, 1889.



Signal Office Lith

Form 106 F

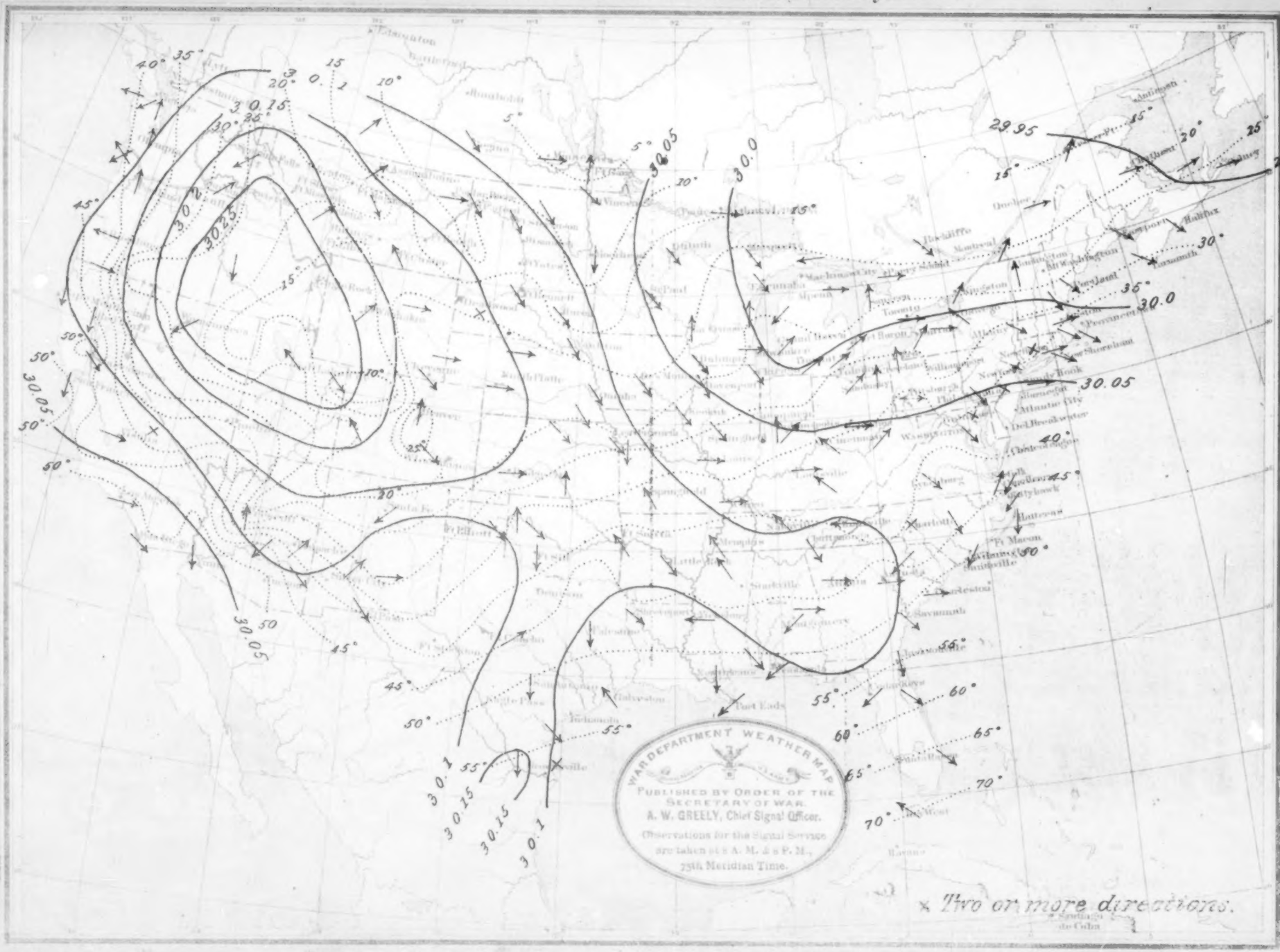
Chart II. Isobars, Isotherms, and Winds. January, 1889.



Signal Office U

Form 106 F

Chart II. Isobars, Isotherms, and Winds. January, 1889.



Signal Office 13

Chart III. Precipitation, January, 1880.

Form 106 F.

Chart III. Precipitation, January, 1889.

Signal Office Lith.

Form 1066 P.

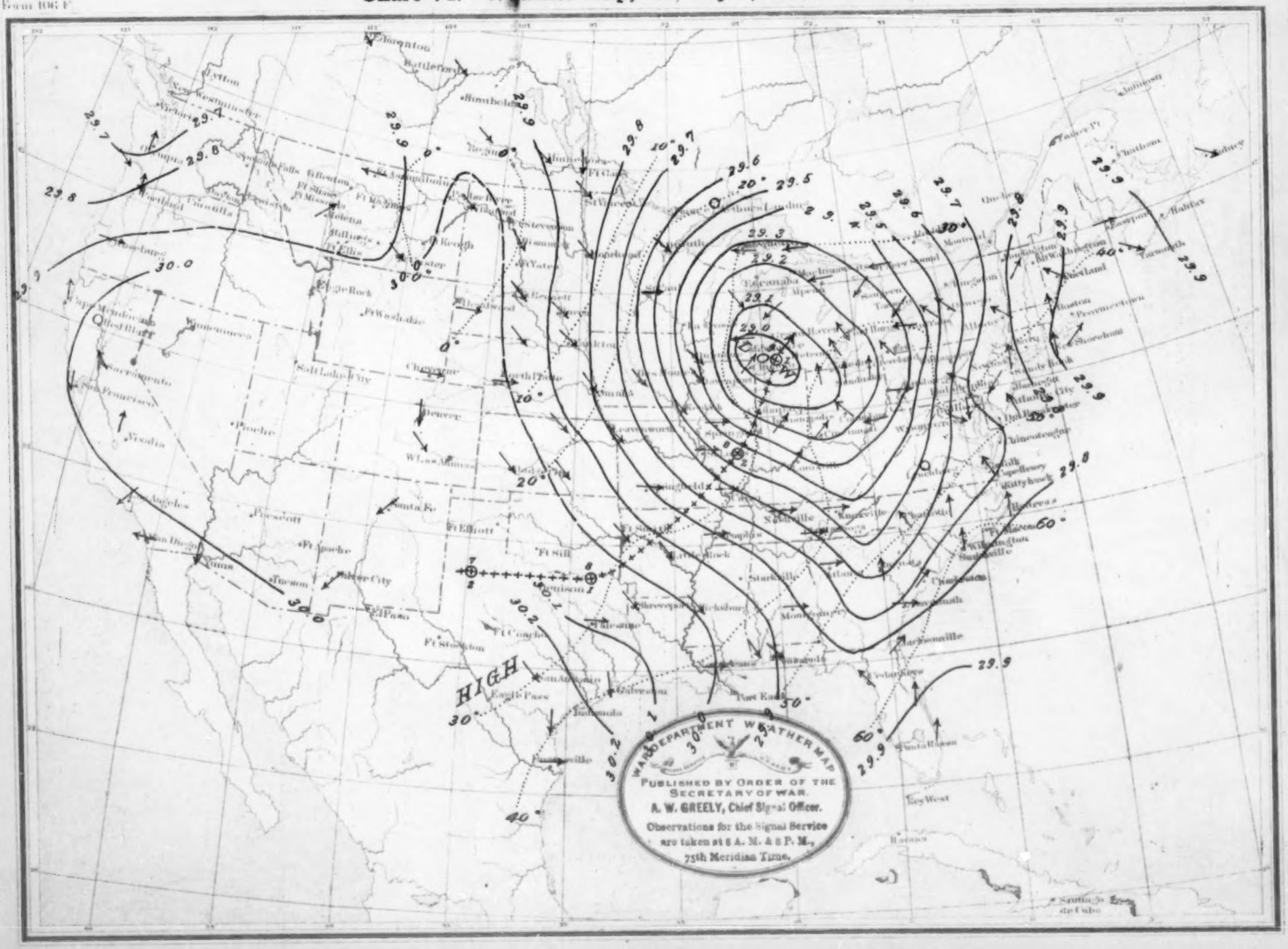
Chart IV. Normal Precipitation for January, from 18 years observations, 1870 to 1888.

Form 886 F

Chart V. Depth of Snow (inches) on ground January 31, 1889, and Limits of Freezing Weather.

Form 106 F

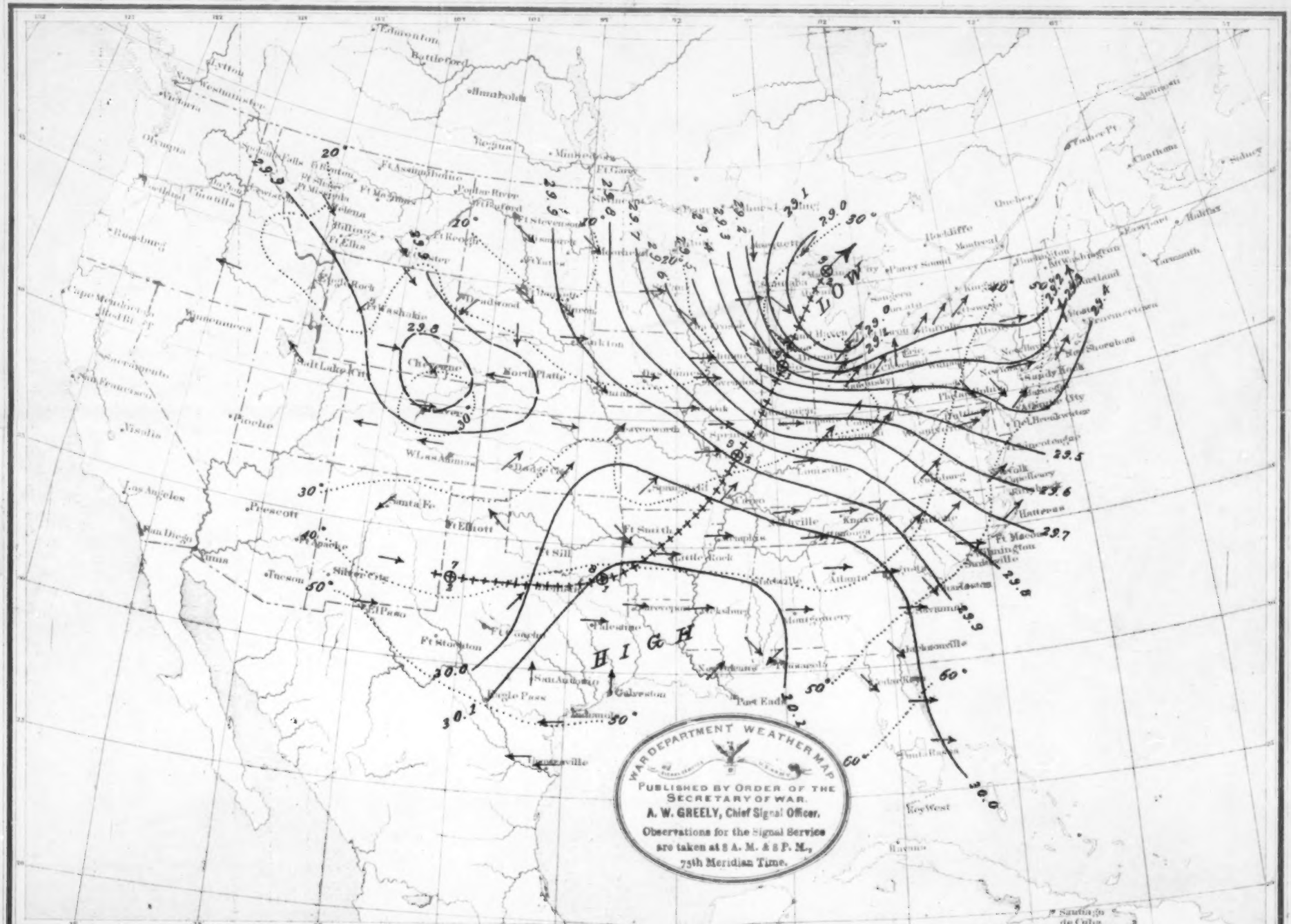
Chart VI. Weather Map, January 9, 1889. 8 a. m.




are taken at 8 A. M. & 8 P. M.,
75th Meridian Time.
Santiago
de Cuba

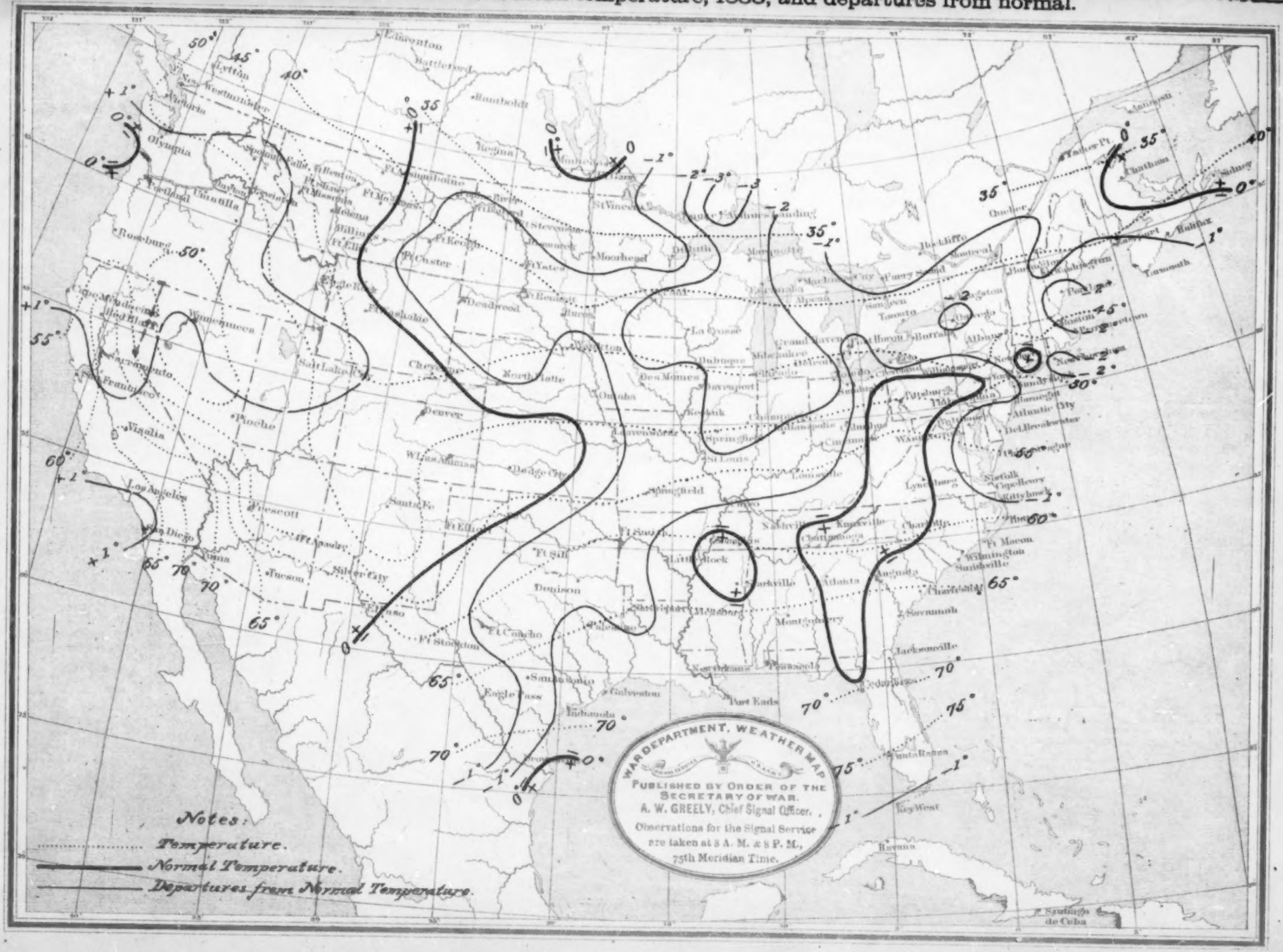
Form 106 F

Chart VII. Weather Map, January 9, 1889. 8 p. m.



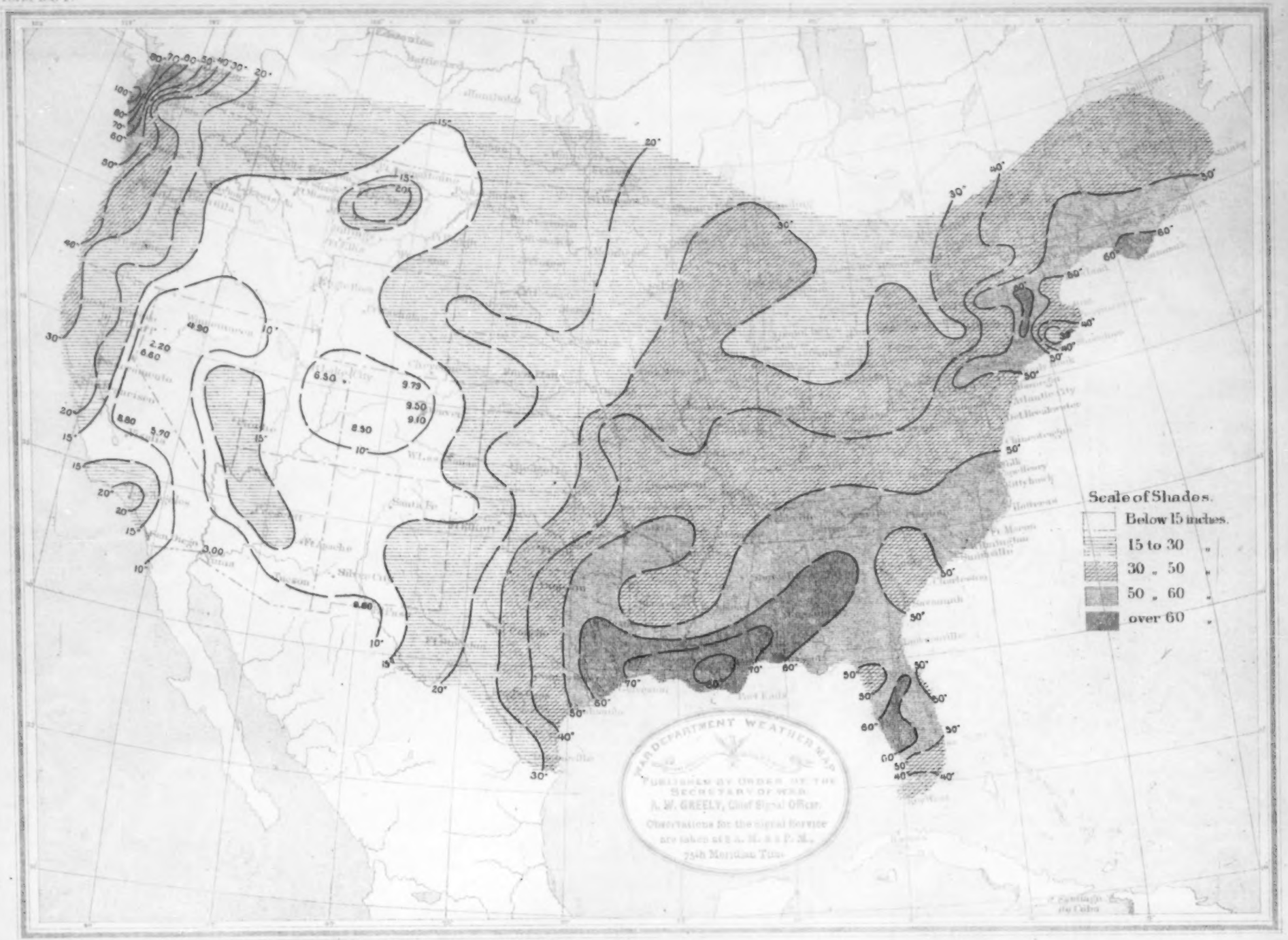
Form 106 F.

Chart VIII. Annual mean temperature, 1888, and departures from normal.



Form 106 F

Chart IX. Annual Precipitation, 1888.



List of voluntary stations of the Signal Service, with their respective observers, who furnish meteorological reports for the Monthly Weather Review. Those marked with an asterisk (*) did not send reports in time to be used in Review for January, 1889.

Place of observation and observer.

ALABAMA.

Auburn, Alabama Weather Service.
Bermuda, Wm. Fowler.
Citronelle, J. G. Michael.
Gadsden, D. P. Goodhue.
Livingston, J. W. A. Wright.
Motes, A. M. Weiler.
New Market, Dr. Geo. D. Norris.
Selma, W. D. Dunlap, Jr.
Troy, Jas. Waldauer.
Valley Head, E. P. Nicholson, M. D.

ARIZONA.

Antelope Valley, Mrs. J. H. Hamilton.
Ash Canyon, John S. Robbins.
Bangharts, Geo. Banghart.
Cedar Springs, R. E. Norton.
Eagle Pass, Dr. R. B. Tripp.
*Flagstaff, Mrs. F. B. Jacobs.
Florence, A. T. Colton, C. E.
Globe, J. H. Hamill.
Holbrook, David Rope.
Huachuca, J. W. Stump.
Phœnix, S. H. Campbell.
*Prescott Junction, W. W. Burnett.
Teviston, Miss Belle Tevis.
Tucson, Edward L. Wetmore.
Williams, J. T. Ryan.
Willow Springs, F. A. Chamberlin.
*Winslow, L. W. Roberts.

ARKANSAS.

Lead Hill, Silas C. Turnbo.
Little Rock, Arkansas Weather Service.

CALIFORNIA.

Anderson, Dr. A. Fouch.
Banning, Welwood Murray.
Barstow, Geo. R. Gooding.
Colegrove, Seward Cole.
Georgetown, C. M. Fitzgerald.
Hanford, Dr. W. H. Miller; N. E. Gribi.
Hydesville, E. T. Foss.
Lewis Creek, John Touhy.
Needles, John J. Clark.
Nicolaus, Alvah Pendleton.
Oakland, Dr. J. B. Trembley.
Oroville, Hiram Arents.
Sacramento, S. H. Gerrish.
Salinas, Dr. E. K. Abbott.
Santa Barbara, H. D. Vail.
Santa Maria, L. E. Blochman.
Susanville, T. B. Sanders.
Willow, David Bentley.

COLORADO.

*Bennett, I. S. Putnam. } Service.
*Colorado Springs, Colorado } Weather
Coulter, Jesse E. Glick.
Delta, J. A. Curtis.
Fort Collins, Prof. L. G. Carpenter.
Georgetown, W. A. Jayne, M. D.
Greeley, E. Bethel.
Rocky Ford, F. Watrous.

CONNECTICUT.

Hartford, Wm. R. Matson.
New Hartford, Wm. Goodwin.
Southington, Luman Andrews.
Voluntown, Rev. E. Dewhurst.

DAKOTA.

Brookings, Prof. Lewis McLouth.
Davenport, J. W. Leech.
Gallatin, S. J. Pound.
Garden City, W. C. T. Newell.
Goddard, Mrs. M. F. Goddard.
*Grand View, J. F. Angus.
*Highmore, W. R. McDowell.
Kimball, A. S. Stuver.
New England City, E. S. Clough.
Parkston, John J. Swartz.
Spearfish, J. H. Warren.
Spring Lake, A. Gould.
Webster, Arthur Betts.
Wolsey, G. W. Frink.
Woonsocket, L. O. Libbey.

DELAWARE.

Newark, Prof. Geo. A. Harter.
Kirkwood, Wm. Carnagy.
Viola, J. A. Farlon.

DISTRICT OF COLUMBIA.

Kendall Green, Deaf & Dumb Institute.
Receiving Reservoir } Washington
Distributing Reservoir } Aqueduct.
Rock Creek Bridge }

FLORIDA.

Altamonte Springs, E. P. Tebeau.
Alva, Chas. E. Robins.
Fort Meade, A. H. Adams.

Place of observation and observer.

FLORIDA—Continued.

Homeland, J. S. Wade.
Kissimmee, E. E. W. Brewster.
Manatee, Mrs. Mary W. Broberg.
Matanzas, Mrs. B. E. Dupont.
Merritt's Island, Rev. J. H. White.
Tallahassee, Rev. Dr. W. H. Carter.
Villa City, J. Emory Round.

GEORGIA.

Andersonville, H. W. Bryant.
Athens, Prof. L. H. Charbonnier.
Duck, A. L. Gillespie.
Forsyth, Thos. G. Scott.
Hephzibah, R. L. Rhodes.
Marietta, G. S. Owen.
Milledgeville, S. A. Cook.
Quitman, J. L. Cutler.
*Thomasville, C. S. Boudurant.

IDAHO.

Lewiston, Robert Schleicher.

ILLINOIS.

Charleston, J. B. Dazey.
Collinsville, Dr. J. L. R. Wadsworth.
*Jacksonville, P. J. Hasenstab.
Mattoon, Wm. Dozier.
Mount Morris, Wm. Feary.
Oswego, John S. Seely.
Palestine, John E. Templeton.
Pekin, Rev. J. E. Terborg.
Peoria, Dr. Fred. Brendle.
*Philo, H. A. Burr.
Riley, John W. James.
Rockford, T. D. Robertson.
Sandwich, Dr. N. E. Ballou.
South Evanston, Dr. M. D. Ewell.
Springfield, Illinois Weather Service.
Sycamore, Roswell Dow.
Windsor, A. H. Hatch.

INDIANA.

Butlerville, C. F. Hole.
Dana, J. E. Wright.
Huntertown, J. E. Hunter.
Jeffersonville, J. C. Loomis.
*Laconia, Lafe Crozier.
La Fayette, Indiana Weather Service.
Mauzy, Elwood Kirkwood.
New Providence, Prof. E. S. Hallett.
Point Isabel, Jas. F. Hood.
Salem, J. W. May.
Scalesville, Urias Wilson.
Sunman, B. F. Ferris.
Vevay, Prof. Chas. Boerner.

INDIAN TERRITORY.

Caddo Creek, P. Leming, M. D.
Jimtown, M. M. Yeakley.

IOWA.

Albion, Enoch Lewis.
Amana, Conrad Schadt.
Ames, J. Rush Lincoln.
Bancroft, H. N. Renfrew.
Blakeville, James Rogers.
Cedar Rapids, H. D. Olds.
Clarinda, A. S. Van Sandt.
Clinton, Luke Roberts.
Cresco, Gregory Marshall.
Cromwell, Harry C. Harrison.
Denmark, G. B. Brackett.
Des Moines, Adolphus Voegeli.
Dunkerton, J. W. Boyle.
Dysart, Jos. Dysart.
Elkader, J. N. Hamilton.
Fayette, Upper Iowa University.
Fort Madison, Miss L. A. McCready.
Gillett, H. L. Pierce.
Glenwood, Seth Dean.
Glenwood, A. Schappel.
Grinnell, Prof. S. J. Buck.
Hampton, E. C. Grenelle.
Humboldt, Miss Florence Prouty.
Independence, Emil F. Wülfke.
Iowa City, Prof. A. A. Veblen.
Iowa City, Iowa Weather Service.
Logan, Mrs. M. B. Stern.
Manson, W. L. Thompson.
Maquoketa, A. B. Bowers.
Monticello, H. D. Smith.
Mount Pleasant, Dr. Max E. Witte.
Mount Vernon, Prof. Alonzo Collin.
Muscatine, J. P. Walton.
Osage, G. D. Pattingill.
Osceola, F. M. Kyte.
Oskaloosa, Joseph Boyd
*Oskaloosa, O. H. Avey.
Sac City, Dr. Caleb Brown.

Place of observation and observer.

IOWA—Continued.

*Smithland, Dr. Chas. W. Rice.
Vinton, T. F. McCune.
Washington, Wm. A. Cook.
Wesley, Wm. Ward.

KANSAS.

Allison, John J. Cass.
Bendena, G. Campbell.
Cawker City, A. G. Alrich.
Colby, C. E. Bennett.
Cunningham, E. Shaw.
Elk Falls, Dr. A. C. Williams.
Emporia, Prof. J. H. Dinsmore, Jr.
Englewood, C. D. Perry.
Gibson, C. M. Bell.
*Globe, Wm. Featherston.
Havensville, L. W. Dennen.
Independence, J. M. Altaffer.
La Harpe, Isaac S. Coe.
Lawrence, Prof. F. H. Snow.
Lebo, C. W. Burnet.
Leoti, L. C. Vickrey.
Manhattan, C. P. Blachley.
Manhattan, F. J. Rogers.
Morse, R. P. Edgington.
Salina, J. H. Gibson.
Santa Fe, Judge A. P. Meminger.
Sedan, J. W. Goodell.
Topeka, Kansas Weather Service.
Tribune, S. B. Jackson.
Wakefield, Wm. P. Cochran.
Wellington, John H. Wolfe.
Yates Centre, F. R. Gray.

KENTUCKY.

Ashland, J. M. Ferguson.
*Bernstadt, John Planta.
Bowling Green, M. H. Crump.
Falmouth, F. G. Held.
Frankfort, E. C. Went.
Lexington, V. E. Muncy.
Louisville, Kentucky Weather Service.
Madisonville, T. J. Gill.
Millersburgh, C. Pope.
Mount Sterling, H. C. McKee.
Owensborough, Watkins & Carter.
Owenton, J. S. Cox.
Pellville, Oscar Haynes.
Richmond, J. R. Cooke.
Shelbyville, H. W. Prissler.
South Fork, A. B. Gilbert.

LOUISIANA.

Cameron, Hon. J. P. Henry.
Convent, Prof. F. Greene.
Crowley, A. B. Goodrich.
Franklinton, T. M. Babington.
Grand Coteau, Rev. C. M. Widman.
Houma, H. F. Belanger.
Liberty Hill, E. A. Crawford.
Luling, F. M. Rogers.
Mandeville, Hon. Alex. Baird.
Marksville, Leon Molenar.
Mount Airy (near), Dr. L. D. Chauff.
New Iberia, Mrs. J. A. Gilbert.
New Orleans, Louisiana Weather Service.
Port Eads, Mrs. C. L. Kleinpeter.
Port Eads, Miss Mattie Lawes.
Vidalia, L. P. Ault.

MAINE.

Bar Harbor, Joseph Wood.
Cornish, Silas West.
Gardiner, Henry Richards.
Kent's Hill, W. C. Strong.
Orono, Prof. M. C. Fernald.

MARYLAND.

Barren Creek Sp'gs, Albert E. Acworth
Cumberland, E. T. Shriver.
Fallston, Prof. G. G. Curtis.
Frederick, McClintock Young.
Gaithersburgh, John T. De Sellum.
Galena, Henry Parr.
*Gambrill's, J. E. Moque.
Great Falls, Washington Aqueduct.
Jewell, Jos. Plummer.
McDonogh, McDonogh Institute.
M't St. Mary's, M't St. Mary's College.
Woodstock, Woodstock College.

MASSACHUSETTS.

Amherst, Miss S. C. Snell.
Amherst, Massachusetts Agricultural Experimental Station.
Blue Hill, Rev. A. K. Teele.
Blue Hill Observatory, A. L. Rotch.
Cambridge, Harvard College Obs'y.

Place of observation and observer.

MASSACHUSETTS—Continued.

Deerfield, Rev. A. Hazen.
Dudley, Conant Observatory.
Fall River, C. V. S. Remington.
Heath, B. B. Cutler.
Holyoke, J. W. Doran.
Leicester, Arthur Kendrick.
New Bedford, Thomas R. Rodman.
Newburyport, F. V. Pike.
North Billerica, C. H. Kohlrausch.
Provincetown, John R. Smith.
Royalston, Miss Lizzie W. Chase.
Somerset, Elisha Slade.
Taunton, E. U. Jones, M. D.
Westborough, G. S. Newcomb.
Williamstown, Williams College Obs'y.
Worcester, J. B. Hall.

MICHIGAN.

Benton Harbor, A. J. McCave.
Berrien Springs, F. A. Zerby.
Birmingham, S. Alexander.
Harrisville, Dr. D. W. Mitchell.
Hudson, Major A. H. Boies.
Kalamazoo, W. A. Black.
Lansing, Dr. H. B. Baker.
Lansing, Michigan Weather Service.
Marshall, G. H. Greener, M. D.
Mottville, J. A. Hartzler.
Thornville, John S. Caulkins.
Traverse City, S. E. Wait.
Ypsilanti, J. C. Bemiss.
Ypsilanti, C. S. Woodard.

MINNESOTA.

Le Sueur, L. B. Davis.
Minneapolis, Wm. Cheney.
Minneapolis, Prof. W. A. Pike.
Northfield, Minnesota Weather Service.

MISSISSIPPI.

Agricultural College, B. W. Kilgore.
Kosciusko, L. Heyman.
Louisville, B. T. Webster.
Macon, A. T. Dent.
Palo Alto, W. H. Hill.
Pearlington, C. D. Kock.
Pontotoc, C. W. Bolton.
Summit, J. N. Teunisson.
University, Mississippi Weather Service.
Waynesborough, W. S. Daries.

MISSOURI.

*Conception, Rev. Fr. Paul.
Excelsior Springs, A. Reinisch.
*Fayette, Prof. T. Berry Smith.
Frankford, W. W. Vermillion.
Grand Pass, E. R. Graham.
Lakenan, C. Ayres.
New Frankfort, G. W. Hawkins.
Ozark, J. J. Brown.
Pierce City, J. J. Spilman.
Princeton, Wm. Hirons.
St. Louis, Missouri Weather Service.
Warrenton, Prof. J. H. Frick.

MONTANA.

Sheldon, P. J. Bond.
Virginia City, Eugene Stark.

NEBRASKA.

Ansley, P. Fowlie.
Creighton, Geo. Roberts.
Crete, Nebraska Weather Service.
Culbertson, G. D. Carrington.
David City, John R. Townsend.
De Soto, Chas. Seltz.
Fairbury, Dr. T. Humphrey.
Falls City, A. B. Newkirk.
Fremont, Isaac E. Heaton.
Genoa, Geo. S. Truman.
Hay Springs, Wm. Waterman.
Kimball, Wm. G. Barton.
Lincoln, University of Nebraska.
Marquette, John Ellis.
North Loup, M. B. C. True.
Syracuse, P. W. Risser.
Tecumseh, W. L. Dunlap.
Weeping Water, G. Treat.

NEVADA.

*Carson City, Chas. W. Friend.
Carson City, Nevada Weather Service.

NEW HAMPSHIRE.

Antrim, Frank W. Palmer.
Berlin Mills, O. A. Bridges.
Concord, W. L. Foster.
Nashua, Chas. H. Webster.
*North Sutton, C. E. Hosmer.
Shaker Village, N. A. Briggs.

Place of observation and observer.

NEW HAMPSHIRE—*Continued.*

Belmont, Bristol, Lake Village, Weir's Bridge, Wolfeborough. } Lake Winipiseogee Cotton and Woollen Manufacturing Co.

NEW JERSEY.

Beverly, C. F. Richardson.
Clayton, W. T. Wilson.
Egg Harbor City, H. Y. Postma.
Jersey City, Wright Babcock.
Moorestown, Thos. J. Beans. [Service.
New Brunswick, New Jersey Weather
Readington, John Fleming.
South Orange, Dr. W. J. Chandler.
Vineland, Dr. O. H. Adams.

NEW MEXICO.

Coolidge, B. S. Mullin.
Gallinas Spring, J. E. Whitmore.
Las Vegas, F. W. Chatfield.

NEW YORK.

Angelica, J. P. Slocum.
Ardenia, Richard B. Arden.
Auburn, Geo. Casey.
Barnes' Corners, W. C. Fawdrey.
Boyd's Corners, Thomas Manning.
Brooklyn, Prof. W. C. Peckham.
Canton, Henry Priest.
Constableville, R. Sanford Miller.
Cooperstown, G. Pomeroy Keese.
Eden, W. P. Hunt.
Elmira, Gerity Brothers.
Factoryville, T. P. Yates.
Fleming, Robt. Warwick.
Friendship, Jesse D. Rogers.
Geneva, Mrs. N. S. Yates.
Hess Road Station, C. H. Spaulding.
Humphrey, Chas. E. Whitney.
Ilion, G. A. Trowbridge.
Ithaca, Cornell University.
Ithaca, New York Weather Service.
*Johnstown, W. S. Snyder.
Kingston, H. A. Stone.
Le Roy, Prof. F. M. Comstock.
Lowville, W. Hudson Stephens.
Middleburgh, F. X. Straub.
Newfane, F. B. Clark.
*New York, Central Park Observatory.
Nineveh, W. J. Barnett.
North Hammond, C. A. Wooster.
North Volney, J. M. Patrick.
Number Four, Chas. Fenton.
Palmyra, L. D. Cummings.
Pendleton, W. D. Lovell.
Penn Yan, Geo. R. Young.
Perry City (near), W. H. Jeffers.
Potsdam, Peter Vilas; G. W. F. Smith.
Queensbury, DeWitt C. Jenkins.
Salem, W. W. Hance.
Saranac Lake, Jas. P. Mills.
Savona, M. S. Collier, M. D.
Setauket, Selah B. Strong.
Somerset, J. W. Thurber.
South Canisteo, J. E. Wilson.
South Kortright, D. C. Sharpe.
Utica, Thomas Birt.

Place of observation and observer.

NEW YORK—*Continued.*

Vermillion, E. B. Bartlett.
*Waddington, Jos. Graves.
Wedgewood, O. F. Corwin.
White Plains, Prof. O. R. Willis.

NORTH CAROLINA.

Asheville, Dr. Karl von Ruck.
Chapel Hill, Prof. J. W. Gore.
Hot Springs, Dr. W. F. Ross.
Lenoir, Dr. R. L. Beall.
*Raleigh, Thos. C. Harris.
Raleigh, North Carolina Weather Service.
Statesville, W. A. Eliason.
Weldon, T. A. Clark.

OHIO.

Bellevue, Wm. Sheffield.
Cleveland, G. A. Hyde.
College Hill, John W. Hammitt.
Collinwood, Wm. Smeed.
Columbus, Ohio Weather Service.
Demos, B. B. Ault.
Elyria, C. W. Goodspeed.
Garrettsville, S. M. Luther.
Gracey, H. M. Scott.
Jacksonborough, Dr. J. B. Owsley.
Kenton, L. J. Demarest.
Lordstown, W. S. Dean.
Napoleon, Dr. T. C. Hunter.
*New Atheus, T. M. Sewell.
North Lewisburgh, H. D. Gowey.
*Portsmouth, Dr. D. B. Cotton.
Ruggles, Peter Bowman.
Tiffin, Rev. T. H. Sonedecker.
Wauseon, Thos. Mikesell.
Westerville, Prof. John Haywood.
West Milton, Luke S. Motte.
Yellow Springs, Chas. W. Rice.

OREGON.

Albany, John Briggs.
Bandon, Geo. Bennett.
East Portland, Dr. Geo. Wigg.
Eola, Thos. Pearce.
McMinnville, Prof. W. J. Crawford.
Mount Angel, Rev. F. Barnabas Held.
Tillamook, A. P. Wilson.

PENNSYLVANIA.

Altoona, Chas. B. Dudley, M. D.
Blooming Grove, John Grathwohl.
Catawissa, Robt. M. Graham.
Corry, Wm. Loveland.
*Drifton, H. D. Miller.
*Dyberry, Theo. Day.
East Brook, L. E. Stunkard.
Easton, Dr. J. W. Moore.
Edinborough, C. F. Sweet.
Franklin, Joseph Bell.
Germantown, Thos. Meehan.
Grampian Hills, Nathan Moore.
Haverford, H. V. Gummere.
Le Roy, Geo. W. T. Warburton.
Meadville, David Logan.
Meshoppen, Stephen S. Jenkins.
*Mount Joy, E. M. Allen.
*Nisbet, J. S. Gibson. [Service.
Philadelphia, Pennsylvania Weather
Philipsburgh, G. F. Dunkle.

Place of observation and observer.

PENNSYLVANIA—*Continued.*

*Pleasant Mount, J. D. Brennan.
Quakertown, J. L. Heacock.
Reading, C. M. Dechant.
Salem Corners, T. B. Orchard, M. D.
State College, Agricultural Experimental Station.
Troy, M. Gustin.
Wellsborough, Hiram D. Deming.
West Chester, Dr. Jesse C. Green.
Westtown, Wm. F. Wickersham.

SOUTH CAROLINA.

Aiken, Dr. W. H. Geddings.
Cedar Springs, J. T. Bayerly. [vice.
Columbia, South Carolina Weather Ser-
Conway, J. G. Rogers.
Kirkwood, Colin Macrae.
Statesburgh, Dr. W. W. Anderson.

TENNESSEE.

Ashwood, Rev. C. F. Williams.
Austin, P. B. Calhoun.
Milan, Dr. M. D. L. Jordan.
Nashville, State Board of Health.
Riddleton, F. K. Fergusson.

TEXAS.

Austin, Oscar Samostz.
Baird, D. Richardson.
Bear Creek Ranche, W. H. Potter.
Belton, E. A Sterling.
Brazoria, H. Stevens.
Brenham, J. G. Sloan.
Brownwood, J. F. Mayo.
Cedar Hill, J. P. Berry.
Cleburne, P. J. Norwood.
College Station, Prof. J. H. Kinealy.
*Colorado, Fred R. Blount.
Columbia, J. S. Rogers.
Comanche, E. U. Wiesendanger.
Corsicana, E. L. Gibson.
Corsicana, W. H. Hamilton.
Decatur, H. D. Donald.
Forestburgh, J. N. Morris.
Fort Worth, Whit Dryden.
Gallinas, Lum Woodruff.
Galveston, Texas Weather Service.
Granbury, E. H. Snider.
Houston, A. Hutchinson.
Huntsville, G. Buckingham.
Ingersol, E. T. Page.
La Grange, Jos. Cottam.
Lampasas, Dr. C. M. Ramadell.
Longview, G. W. Krech.
Luling, W. H. Rather.
Mesquite, Silas G. Lackey.
Mexia, Chas. F. Mercer.
New Braunfels, Paul Wipprecht.
*New Ulm, C. Runge.
Silver Falls, C. M. Tilford.
*Snyder, A. C. Wilmeth.
Tyler, C. E. Wood.
Victoria, W. S. Chimett.
Waco, W. H. Godber.

UTAH.

Lake Park, F. Blume.

Place of observation and observer.

VERMONT.

Brattleborough, W. H. Childs.
Burlington, W. B. Gates.
Coventry, W. H. Tibbetts.
East Berkshire, J. H. Mears.
Lunenburgh, Dr. Hiram A. Cutting.
Manchester, Rev. E. P. Wild.
Middlebury, S. Holton.
*Newport, M. B. Trasher.
Saint Johnsbury, F. Fairbanks.
Strafford, H. F. J. Scribner.

VIRGINIA.

Bird's Nest, C. R. Moore.
Christiansburgh, H. D. Walters.
Dale Enterprise, L. J. Heatwole.
Marion, A. T. Lincoln.
Petersburgh, Jas. M. Colson, Jr.
Spottsville, B. W. Jones.
Summit, J. R. Sim.
University of Va., James Wearmouth.
*Variety Mills, J. H. Micklem.
Wytheville, Howard Shriver.

WASHINGTON TERRITORY.

Blakeley, R. M. Hoskinson.
Tacoma, E. N. Fuller.
Vashon, Mrs. C. B. Carpenter.

WEST VIRGINIA.

Clarksburgh, R. T. Lowndes.
*Hartmonsville, W. C. Tabb.
Helvetia, Dr. C. T. Stucky.
Middlebrook, S. F. H. Hewit.
Parkersburgh, T. G. Field.
*Rockport, R. D. J. Echols.
Tyler Creek, F. M. Swann.
*White Sulpher Springs, T. Surber.

WISCONSIN.

Cadiz, B. C. Curtis.
Delavan, George L. Collie.
Embarrass, J. E. Breed.
Fond du Lac, J. C. Wedge.
Fredonia, B. H. Meyer.
Glasgow, Henry M. Crombie.
Lincoln, A. J. Loose.
Madison, Washburn Observatory.
Manitowoc, Miss Clasina Lüps.
Oshkosh, Prof. W. N. Mumper.
Waucousta, G. H. Yapp.
Weston, R. R. Wilkinson.

FOREIGN.

*Burnside, S. A., Dr. C. J. Hering.
*Grand Turk, W. Indies, Geo. I. Gibbs.
Guanajuato, Mexico, Met'l Obs'y.
Hamilton, Bermuda, General Russell Hastings.
Killisnoo, Alaska, Jos. Zuboff.
Leon, Mexico, Prof. M. Leal.
Mazatlan, Mexico, Leon P. Acosta.
Mexico, Mexico, Meteorological Obs'y.
Monterey, Mexico, Dr. Wm. De Ryee.
*Montreal, Quebec, C. H. McLeod.
New Westminster, B.C., Capt. A. Peele.
Port au Prince, Hayti, Prof. I. Scherer.
*Pueblo, Mexico, Catholic Institute.
Zacatecas, Mexico, Jose A. y Borrilla.

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for January, 1889.

Alabama.
Mount Vernon B'ks.

Arizona.
Apache, Fort.
Huachuca, Fort.
Lowell, Fort.
McDowell, Fort.
Mojave, Fort.
San Carlos.
Verde, Fort.
Whipple Barracks.

Arkansas.
Hot Springs.
Little Rock, Barracks.

California.
Alcatraz Island.
Angel Island.
Benecia Barracks.
Bidwell, Fort.
Gaston, Fort.
Mason, Fort.
Presidio of San F.
San Diego Barracks.

Colorado.
Crawford, Fort.
Denver (near).
Lewis, Fort.
Lyons, Fort.

Connecticut.
Trumbull, Fort.

Dakota.
A. Lincoln, Fort.
Bennett, Fort.
Buford, Fort.
Meade, Fort.
Pembina, Fort.
Randall, Fort.
Sisseton, Fort.
Sully, Fort.
Totten, Fort.
Yates, Fort.

Florida.
Barrancas, Fort
Saint Francis B'ks.

Idaho.
Boisé Barracks.

Idaho—Cont'd.
Sherman, Fort.

Illinois.
Rock Island Arsenal.
Sheridan, Fort.

Indian Territory.
Gibson, Fort.
Reno, Fort.
Supply, Fort.

Kansas.
Hays, Fort.
Leavenworth, Fort.
Leavenworth Prison.
Riley, Fort.

Kentucky.
Newport Barracks.

Maine.
*Kennebec Arsenal.
*Preble, Fort.

Maryland.
McHenry, Fort.

Massachusetts.
Springfield Armory.

Massachusetts—Con.
Warren, Fort.

Michigan.
Brady, Fort.
Mackinac, Fort.
Wayne, Fort.

Minnesota.
Snelling, Fort.

Missouri.
Jefferson Barracks

Montana.
Assinaboine, Fort.
Custer, Fort.
Keogh, Fort.
Maginnis, Fort.
Missoula, Fort.
Poplar River, Fort.
Shaw, Fort.

Nebraska.
Niobrara, Fort.
Omaha, Fort.
Robinson, Fort.
Sidney, Fort.

Nevada.
*Fort Halleck.
McDermitt, Fort.

New Mexico.
Bayard, Fort.
Seldon, Fort.
Union, Fort.
Wingate, Fort.

New York.
Columbus, Fort.
David's Island.
Hamilton, Fort.
Madison Barracks.
Niagara, Fort.
Plattsburgh Barracks.
Porter, Fort.
Schuyler, Fort.
Wadsworth, Fort.
Watervliet Arsenal.
West Point M. A.
Willett's Point.

Ohio.
Columbus Barracks.

Oregon.
Klamath, Fort.

Pennsylvania.
Allegheny Arsenal.
Frankfort Arsenal.

Rhode Island.
Adams, Fort.

Texas.
Bliss, Fort.
Brown, Fort.
Clark, Fort.
Concho, Fort.
Davis, Fort.
Eagle Pass, Camp.
Elliott, Fort.
Hancock, Fort.
McIntosh, Fort.
Pena Colorado, Camp.
Ringgold, Fort.
San Antonio, Fort.

Utah.
Du Chesne, Fort.
Douglas, Fort.

Virginia.
Monroe, Fort.
Myer, Fort.

Washington Ter.
Spokane, Fort.
Townsend, Fort.
Vancouver, Fort.
Walla Walla, Fort.

Wyoming.
Bridger, Fort.
D. A. Russell, Fort.
Laramie, Fort.
McKinney, Fort.
Pilot Butte, Camp.
Sheridan, Camp.
Washakie, Fort.